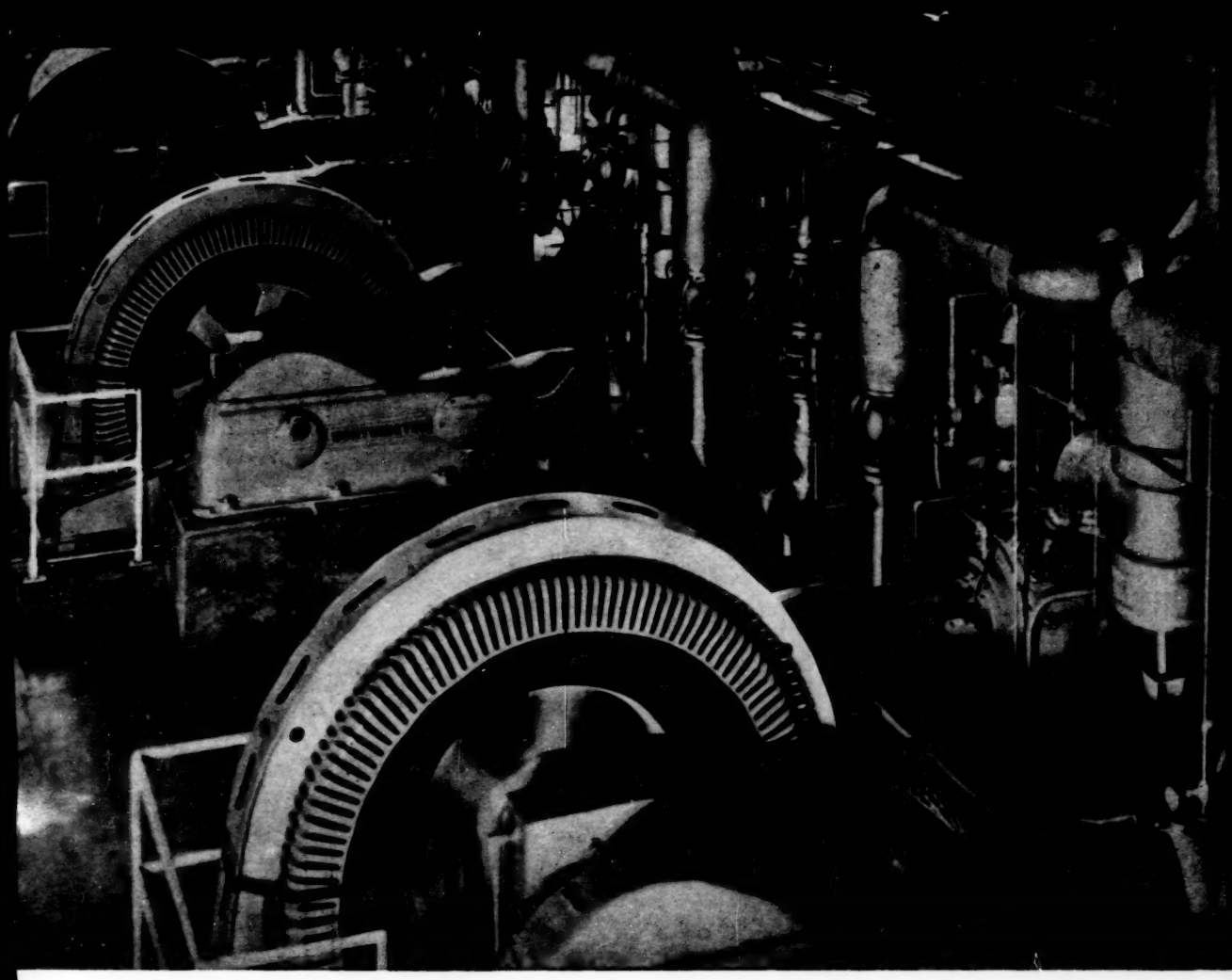
INDUSTRIAL REFRIGERATION



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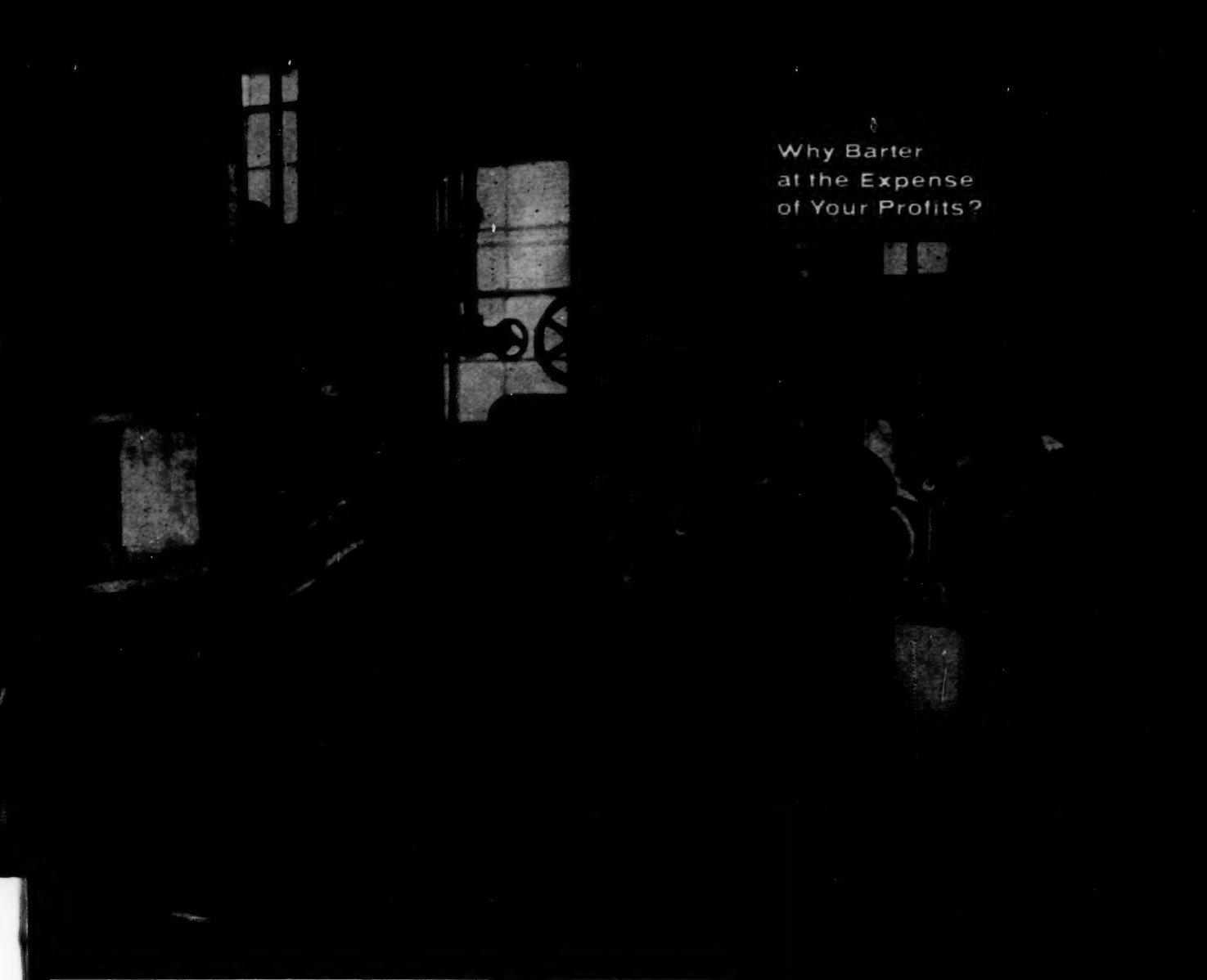

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Industrial Refrigeration

January, 1958

Number 1

Vol. 134

Now in its 67th Year of Publication

J. F. NICKERSON, Founder

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Contents

Inyokern Test Center Produces Climatic Changes 13
Specially Built Racks for Freezing Hams 18
American Coils Follows a Trend—Sets Another 19
Air Conditioning—It's Growth and Impact 22
Scientists Discuss Low Temperature Applications 23
Report on Performance of Refrigerated Rail Cars 24
Report on Freezing Points of Fruits and Vegetables 25
Advisory Group Urges Use of T-T-T Information 26
Low Temperature Humidity Recorder 26
Southwestern Ice Manufacturers Annual Convention 27
Venezuela Shirt Factory Installs Air Conditioning 46
Patching Concrete Floors in Refrigerated Warehouse 50
National Association Practical Refrigerating Engineers 30
From the President's Desk 30
Proper Refrigeration Increases Meat Profits 31
NAPRE Question Box 37
Chapter Activities 41

Departments

What's New in Equipment .. 4
Press Briefs 9
In The Spotlight 11
News of People 53
Manufacturers News 53
Catalogs and Bulletins 54
Coming Conventions 51

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The Cover:

Navy research scientist and engineer technicians check out controls in the rocket test space at Inyokern, California. Here at the USN Ordnance Test Center, this low temperature research facility simulates at rocket speeds, the atmospheric conditions which a rocket undergoes in its flight. See page 13 for the part refrigeration plays in this timely scientific work.

What's New

MACHINERY
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New Machine Makes Varied Shapes of Ice

A NEW line of ice-making equipment which can produce any size ice, ranging from king-sized crescents to thin-ice wafers at the turn of a dial has been developed by the York Corporation, subsidiary of Borg-Warner, it was announced by Robert E. Cassatt, general sales manager of packaged products.

New ice making machine supplies various shapes of ice.

The machines, which are used by restaurants, hotels, supermarkets, hospitals and many other businesses demanding rapid manufacture of clean ice, incorporate a selector dial which, when turned to the desired ice shape, instantaneously manufacturers the specific ice size required.

Three selector-dial models are available. An air-cooled model makes 200 lbs. of ice a day; a water-cooled machine produces 225 lbs. per day and a larger water cooled model makes 450 lbs. per day.

All models feature fracture proof freezers made of stainless steel; wrap-around freezing tubes which increase efficiency and result in lower operating costs and positive harvest control. This latter feature results in uniform ice sizes as there are no moving parts and no electrical timing devices to go awry.

In addition to the selector-dial models, York offers three air cooled and three water cooled ice flake machines ranging in capacity from 300 lbs. per day to 8000 lbs. per day.

These machines, for commercial uses in a wide variety of enterprises, feature a freezer drum filled with refrigerant for faster freezing and lower operating costs. In each of these models, the cutter is outside the drum, eliminating the possibility of cutters damaging freezing tubes. Because of the easy availability of the drum for cleaning, owners can more easily meet sanitary codes than with machines which freeze ice flakes inside of the drum.

New Truck Refrigeration

A NEW line of Coldmaster delivery truck refrigeration units has been announced by the Truck Refrigeration Division of Construction Machinery Co., Waterloo, Iowa.

A unique feature of Coldmasters is that they have an all-electric system which assures greater dependability, less maintenance and longer life of the units. It also provides uniform refrigeration capacity regardless of truck or engine speed. The all-electric system permits using readily available 110 volt single phase current for standby operation. Both mechanical and electric load-limiting controls are provided such as reduced load starting, limited compressor suction pressure and safety controlled shut down on overload with automatic time interval restart.

The units are available in three types to fit any truck body:

(1) Model No. RE 150-A Nose Mount —a one-piece unit with out-of-the-way mounting which provides excellent condenser cooling characteristics and particularly protection from road dust and water. Also available as a two-piece unit on special order.

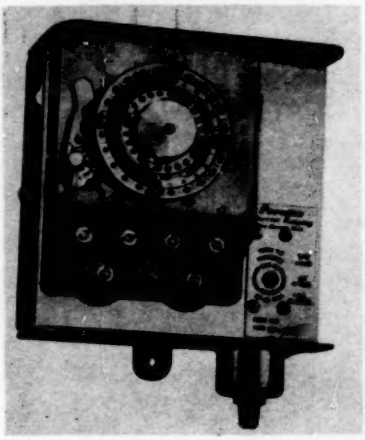
(2) Model No. RE 150-B Side Mount —Normally furnished as a one-piece unit. Condenser and evaporator are both inside the truck body, with the condenser effectively insulated on all inside surfaces. Also available as a two-piece unit on special order.

(3) Model No. RE 150-C Skirt Mount —easy to service, easy to install-out-of-the-way mounting has condensing unit outside of trucks with evaporator mounted inside truck body. A two-piece unit. Requires no framed opening in truck.

The capacity of all three types of Coldmasters range from 12,000 Btu per hour at 85 F to 10,000 Btu per hour at 120 F atmospheric temperature.

Defrost Control

THE Paragon TP-300 Series time initiated-pressure terminated defrost control for electric heat defrosting, hot gas defrosting and compressor shut-down defrosting, was exhibited by the Paragon Electric Company, Two Rivers, Wis., pioneer in automatic defrost control, at the ARI 10th Air Conditioning and Refrigeration Exposition at Chicago November 18 to 21.



Paragon TP-300 Defrost Control.

In operation the TP-300 Series is connected to the suction side of the refrigeration system by a copper tube. It is electrically connected to the compressor starter and a heating element, if it is used for electric heater defrosting. The time control may be set to defrost at predetermined intervals and will break the circuit to the compressor and energize the heater circuit. The compressor will remain stopped and the heater circuit on until the back pressure builds up to a pressure corresponding to a defrosted evaporator coil. This pressure may be adjusted on the time control from 30 to 55 pounds. This predetermined pressure increase will transfer the contacts in the time control from a defrost cycle to a refrigeration cycle and the compressor will come back "on", while the heater circuit will be broken.

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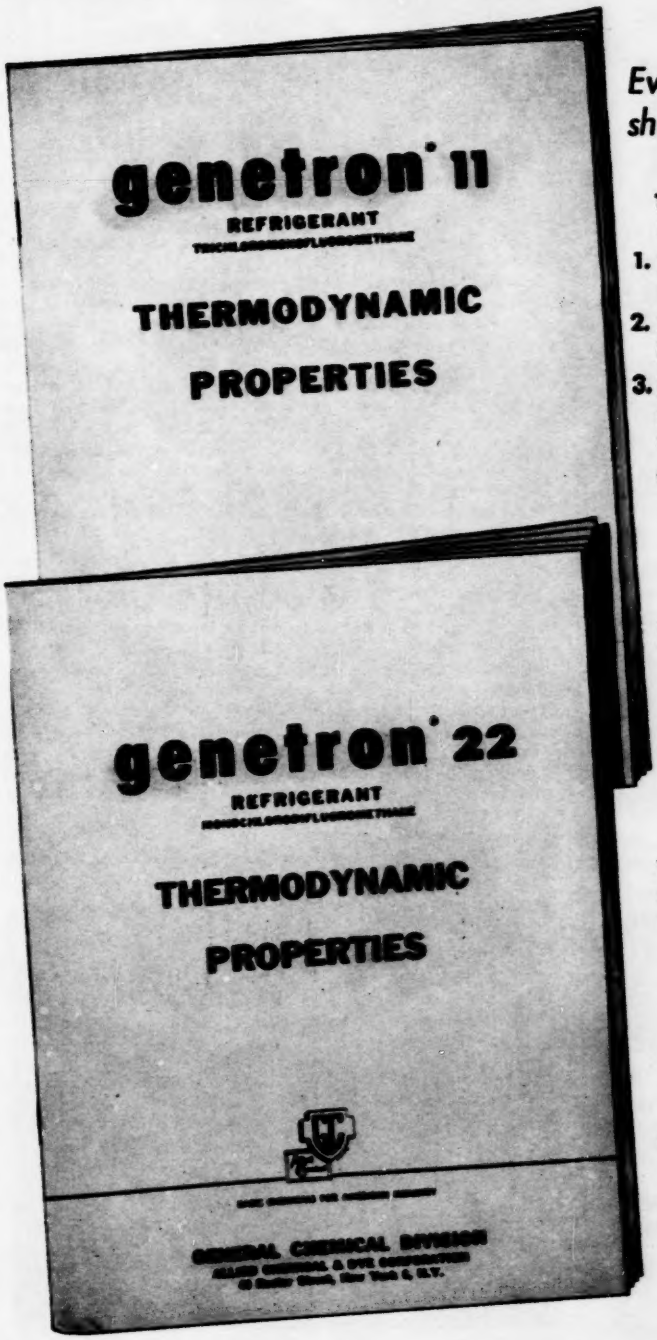
NEW THERMODYNAMIC TABLES ON TWO IMPORTANT REFRIGERANTS



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and
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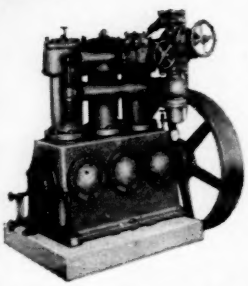

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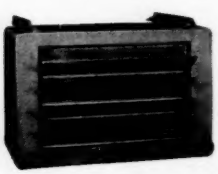

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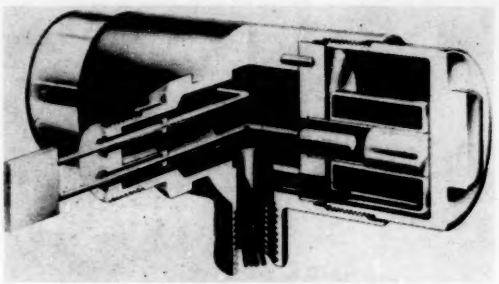
New "Dynatrol" Control For Liquids and Solids

THE development of a different type of level control for the detection of liquid, solid and slurry levels has been announced by the Automatic Products Inc., Houston, Tex.

The Model CH-10 "Dynatrol" utilizes new design principle for extremely accurate and versatile high or low point detection or narrow range proportional control of liquid, solid



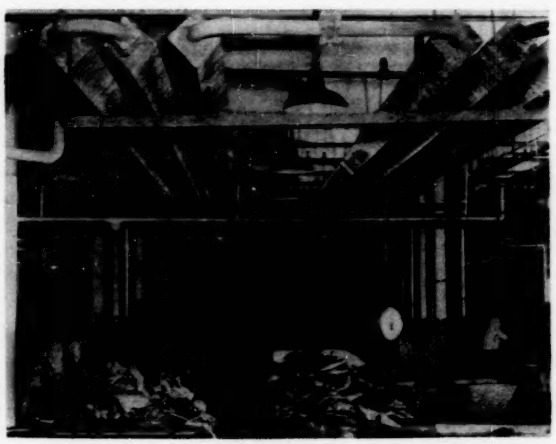
Type CL-10 Dynatrol Level Detector.

and slurry levels. This small and rugged control has a positive acting electrical output control signal that varies with the amount of immersion of the 120 CPS vibrating paddle in the medium being detected. The output signal can be used to control the operation of any type of electrical equipment. Unique design allows sensitive transmission of vibrational energy from the drive end to the sensing paddle and back to the output signal and through a linkage path welded to rigid metal pressure seals at the node points where zero amplitude of vibration occurs. Unit rated for 3000 PSIG pressure-explosion proof 115 VAC-corrosion resistant—any mounting position with only 3/4 in NPT pipe opening required.

Welded Steel Tubing Cuts Weight

WELDED steel tubing is finding ingenious application in equipment components for large refrigeration systems designed for holding and chilling rooms in cold storage warehouses and breweries. A recent component of this type is the Zer-O-Disc fin coil, made by The Vilter Manufacturing Company of Milwaukee, Wis., and shown installed in a beef boning room of a large Mid-western packing plant. Welded steel tubing has been adopted for fabrication of the cooling coil because the welded tubing conforms to closer tolerances in dimensions and roundness and has smoother inside and outside finish than pipe formerly used.

Backbone of the fin coil is a 2-3/8 inch O.D. x .148 inch



Finned cooling coils installed in mid-western packing plant.

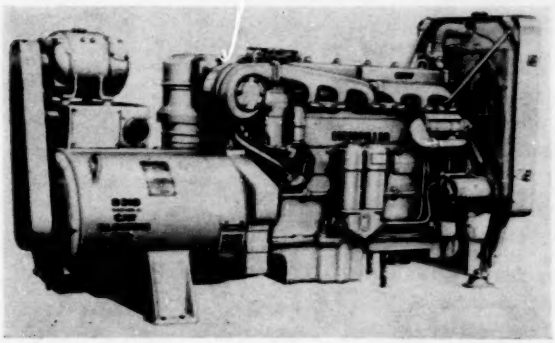
wall of welded carbon steel tubing on which 7-1/2 inch square cooling fins of 16 gauge steel are accurately spaced. Welded tubing, which forms the core of this convector, was selected because of its uniform concentricity which expedites assembly of the fin plates to the tubing core and because of easy workability which allows for the ends of the coils to be prepared for threading, welding or flanging. The importance of welded steel tubing's extreme concentricity lies in the fact that the fin plates are merely forced on over the tubing with only slight mechanical friction holding them in place at the beginning of assembly.

After the fin plates have been accurately spaced, and while still held in place only by friction, the welded steel tubing is expanded slightly to form an effective mechanical friction bond between the fin and the tube. This "all-around" bond, after expanding, is made uniform largely because of the concentricity of the tube. Following this process, the entire assembly is hot-dipped galvanized which fills in around the circumferential recess in the heel of the fin plate fillets, firmly securing the bond between the fin and the tube. The ready workability of welded steel tubing also allows the tube ends to be prepared for welding, threading or flanging.

Due to the greatly increased surface area created by the addition of fins to a single core of tubing, the fin coil system has the added advantage of weighing 1/3 to 1/2 less than conventional bare pipe coils of equal refrigeration capacity. This reflects favorably in shipping costs, installation handling and a requirement for fewer and lighter hangers.

New Caterpillar Engine

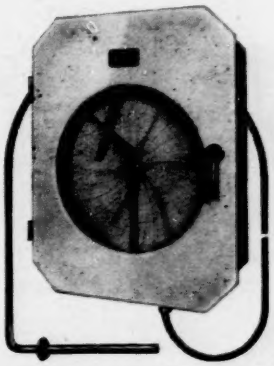
THE COMPACT and durable Caterpillar D318 (Series G) Engine is now available as the power unit for both turbocharged and naturally aspirated electric sets, according to a current announcement by Caterpillar Tractor Co. The new Cat D318 (Series G) Electric Sets combine the recently-announced Series G equivalent of the Cat D318 Engine, with the space-saving and efficient self-regulated constant voltage Cat Generator.



The new Caterpillar D318 (Series G) electric engine.

Contributing to the reduced dimensions of the units is the generator design, which features a top-mounted exciter, and a single, heavy-duty bearing. A flex-plate coupling joining the generator to the engine flywheel eliminates a front bearing, in addition to simplifying alignment. On both electric set versions, the self-regulated, constant-voltage Generator produces 60-cycle, three-phase current at an option of 120, 240, 120/208 or 480 volts at 1800 rpm. Since the regulator contains no moving parts, and no adjustments are necessary after initial setting, the unit is simple to operate and easy to maintain. Voltage is adjustable from 5 percent above to 10 percent below nominal voltage, and regulation can be controlled within 3½ percent of rated voltage. When operated in parallel with other power sources, voltage drop is adjustable.

Both models of the Cat D318 (Series G) Electric Set come complete with 24-volt electric starting, 18-ampere charging generator, and battery charging ammeter. They also are equipped with a vernier-type governor control, supports, flexible fuel lines and instrument panel with fuel pressure, oil pressure and water temperature gauges.



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The thermometer is located outside of the cold room for convenience. Here it records the temperature, which is detected by a sensitive bulb in the locker room. If a temperature record is needed from several locations in the room, the recorder is available with one, two, or three pens.

7-day timing mechanism, range minus 40 to plus 70°F. Meets all state requirements for locker room temperature records.

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Thermo Expansion	Automatic Expansion
Solenoids	Float Switches
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the perfect
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PRESS BRIEFS

Western Cold Storage To Build New Warehouse

TERMINAL Ice and Cold Storage Company, Portland, Ore., has announced it will build a modern refrigerated warehouse on McLoughlin boulevard in the Milwaukie Industrial Park. No cost figure has been given, but it is estimated it will exceed $500,000. The building will occupy a 14-acre tract. The one-story building of reinforced concrete will replace the company's present operations at 320 N. W. Hoyt, where they have been located since 1911.

The new warehouse will contain some 56,000 square feet, more than double the present space, according to Lowell E. Kern, executive vice-president. The expansion program is being undertaken because of the increased volume of frozen food production and distribution in this area.

Rapid and efficient handling of merchandise will be assured by modern materials handling equipment and ample off-street parking area for trucks. Newest type refrigeration equipment will be installed to handle both production freezing and distribution of all types of frozen foods. R. W. Merserau will manage the new warehouse.

Advisory Committee Meets

A RECOMMENDATION that the U.S. Department of Agriculture encourage the widest possible use of the valuable information being developed by its time-temperature-tolerance research in frozen foods was made by the Department's Refrigerated and Frozen Products Research Advisory Committee (formerly USDA Cold Storage Research Advisory Committee) at its annual meeting in Washington, November 12-14.

Presiding as outgoing Committee Chairman was Paul Christensen, Portland, Me. Other warehousemen attending as committee members were William F. Giacomazzi, Jr., San Jose, Calif.; and C. L. Snavely, Lancaster, Pa. Dr. H. C. Diehl director of The Refrigeration Research Foundation, was re-elected Vice-Chairman.

Frozen Fruits in Storage

THE Agriculture Department reports warehouse holdings of apples totaled almost 12 million bushels Sept. 30 as the new season began. Because of greater coverage this year than last, particularly in the Pacific Northwest, the current stocks are not comparable with the six million bushels reported in storage September 30, 1956.

Frozen fruit holdings were increased during September by 18 million pounds, five million more than a year earlier but two million less than average. By September 30, frozen fruit stocks totaled 568 million pounds, the largest on record. Almost 40 percent of these holdings were frozen strawberries which totaled 226 million pounds. This was 37 percent more than average but 4 percent less than a year earlier.

Frozen vegetable stocks reached a new high—988 million pounds, 8 percent above the previous high of 915 million pounds on October 30, 1956. Present stocks were 14 percent larger than a year earlier and 43 percent greater than average.

Orange concentrate stocks were reduced to 29 million gallons. The September reduction of 5 million gallons was equal to the reduction of a year earlier.

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New BALL VALVE

DISCHARGE AND SUCTION VALVES INCREASE THE PERFORMANCE OF ANY COMPRESSOR—OLD OR NEW!

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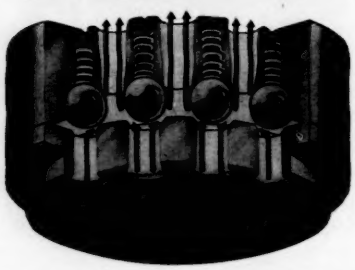
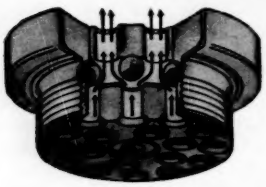


Actual tests conducted by a leading independent research organization* prove that the New Ball Valve *passes 26% more gas!* In operation, users report amazing increases in performance when they install Ball Valves—and not one report of valve failure or breakage in operation! *Name on request.

"BV" SUCTION VALVES



In the Ball Valve, multiple steel balls replace the flat "plate" or "poppet" — resulting in less resistance, better seating, far greater life and improved performance. New "BV" Standardized Suction Valve Assemblies, available for most compressors, allow complete standardization of your suction valves, regardless of the number of different makes of compressors that you have in operation.

Can Be Installed in 3 Minutes

Easy to install, without drilling or tapping. "BV" suction valves are simply screwed in, then locked in place with special locking ring. Removal for inspection is just as quick and easy.

For information on improving the performance of your compressor, send us the name, bore, stroke, speed and serial number of your machine.

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VALVES CARRIED IN STOCK FOR LEADING HEAVY DUTY COMPRESSORS

32 Blocks of Ice Solve Engineering Problem

ONE of the slickest trick ever pulled with ice helped York Refrigeration Corporation, currently installing a 150x100-foot ice skating rink in downtown Denver, Colorado, to meet a unique engineering requirement.

When Dean Dungan, Denver erecting engineer for the York Corporation began the job of building a freezing coil 110 feet long and 65 feet wide and made up of 442 sections of one inch pipe, welded at either end into 110-foot headers, 8 inches in diameter. Each header weighs 5,500 pounds and will accommodate 2,000 gallons of water for pressure testing, as well as later for refrigerant.

To facilitate welding operations and to save time, engineer Dungan set up the headers on screw jacks, lifting them some 22 inches off the pan on which the finished grid was to be lowered and used teams of welders from above and below, simultaneously, to make the 884 welds which joined the lateral one-inch pipes to the header at either end. Finishing up the job in record time, the welding crews executed a perfect bond at the first attempt and did away with any necessity for repairs or replacements.

Because extremely fine welds had been used throughout the big job, the York Corporation engineers were worried over the task of lowering the heavy grid straight down into its resting place without the danger of jars, or twisting stresses which could easily crack the weld or even pull any length of pipe out of the header. It was here that engineer Dungan turned to the use of blocks of ice in place of the usual screw jacks employed for such purposes.

To lower the big steel grid slowly and evenly, 22 blocks of ice, each measuring 39x22x11½ inches were used on one side, and 10 blocks of the same dimensions on the opposite side. The blocks of ice were frozen to approximately the same height as the jacks supporting the grid, and then simply scooted under the header pipe, on either side, where the jacks were lowered only partial turns in order to bring the weight of the heavy installation directly on the ice. Then, beginning at 5:00 o'clock in the evening, when temperatures were even throughout the area, the ice melted uniformly at the rate of 14 inches in 16 hours to lower the grid work securely in place.

New Cape Town Storage

WORK is progressing on a new pre-cooling store for deciduous and citrus fruit at Cape Town, South Africa. The new storage will eventually have a capacity of 10,000 tons. The South African Railways and Harbours Administration is confident that Cape Town, which last year handled more than half of the 524,821 tons of fruit exported, will be able to cope with the steadily increasing volume of perishable exports.

The ground floor of the new building will be used as a reception air-lock and will have a rail track running through the center. Incoming fruit will be loaded and sorted on this floor, after which it will be conveyed by elevators to the first floor on which 56 pre-cooling rooms will be located. Each of these precooling rooms is designed to accommodate two rows of nine fully loaded four-ton skids parked side by side, allowing a minimum of air space between the skidloads and the walls. This arrangement insures that cooling air is passed directly through the boxes of fruit.

In the Spotlight

SPUTNIK I and II, followed by the Vanguard fizzle, certainly kicked off considerable political finger-pointing, scientific buck-passing and even mild histeria among John Q. Public. Therefore, it was very reassuring to the editorial department of this publication to receive the contributed article on page 13. Apparently refrigeration contributions to this overly publicized international Geophysical Year project have been more than successful.

SOMETIMES, the only way out of a serious manufacturing bottleneck is a fresh start. American Coils Co. "de-urbanized" to double its present output. Moreover, success of their unique water-to-air heat pump system suggests that below freezing weather should not be considered a barrier to the use of heat pumps in industrial applications. See page 19 for a dual feature.

THE CREATION and maintenance of an ice floor at frequent intervals for hockey games confronts the personnel at the Cincinnati Gardens. How this is accomplished is told in the short article on page 17.

THE ADVISORY Group of the United States Department of Agriculture at its recent annual meeting recommended that widest possible use be made of information developed by the time temperature tolerance research in frozen foods. See page 26.

A BULLETIN issued by The Refrigeration Research Foundation includes a discussion of research reporting on two hygrometer developments for the measurement of atmospheric humidity at freezing temperatures. See page 26.

BRINE spray systems in meat packing plants have cost that industry more money in shrinkage annually than they have netted in profits! So said two Recold engineers at the 48th Annual NAPRE meeting. Backing up their criticism of brine use, these executives of this West Coast manufacturer constructively offered the use of dry finned surface evaporators with water defrost. Based on numerous case applications, they estimate approximate savings of half present shrinkage losses in carcass cooling with brine. Additional savings can be made through reduced corrosion losses. See page 31, for increasing meat profits.

AIR CONDITIONING became more firmly intrenched as integral parts of life in America during 1957 and the future seems even rosier. This opinion is expressed by Geo. S. Jones, Jr., Managing Director of The Air Conditioning and Refrigeration Institute in a year-end statement. Particularly noticeable is the fact that commercial and industrial establishments continued their climb. See page 22.

FREEZING points of fruits and vegetables and florist stocks are discussed in a recent issue of Industrial Marketing. This will be of interest to cold storage operators, growers and others involved in marketing and handling these products, particularly since freezing points vary for different kinds and varieties of products. This report is summarized in article on page 25.

A REPORT on the performance of refrigerated rail cars has been issued by the Marketing Research Division, United States Department of Agriculture. This report is summarized in article on page 24.

LOW TEMPERATURE applications were discussed by scientists at the Cyrogenic Engineering Conference held at Boulder, Colo. The large attendance and 44 papers provided evidence that the low temperature field continues to attract increased attention from industry and defense. For report on the conference see article starting on page 23.

PSYCHROMETRICS dominate the NAPRE Question Box this month. More engineers and supervisory personnel involved with industrial refrigeration and air conditioning applications, are becoming aware of the importance of understanding this subject. See page 37.

A REFRIGERATION rating project is being conducted on a commercial type refrigerated semi-trailer by the National Bureau of Standards. For report on this project see page 47.

SPECIALLY constructed racks for freezing hams in refrigerated warehouses are described and illustrated in article on page 18.

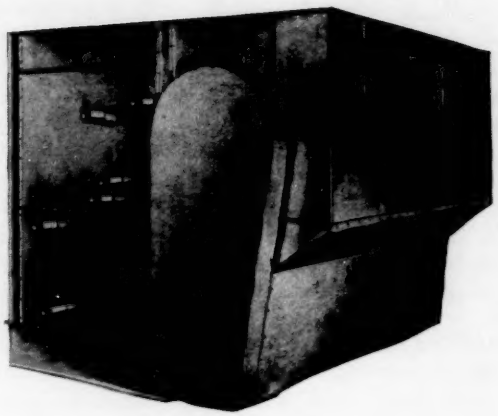
THE SOUTHWESTERN Ice Manufacturers Association held its 67th Annual Convention in Austin, Texas, December 1-3. For report of meeting see page 27.

A SAFETY EXHIBIT and talk was one of the features of the Southwestern Ice Convention. For brief description and picture see page 27.

This Cat Was Cool

A NEW use for ice was discovered by Jim Keyton, Jr., manager of the Colquitt Ice Company, Moultrie, Georgia. A tourist stopped at the plant and asked to have her hot water bottle filled with crushed ice (what will they think of next?). After the bottle was filled, observing the questioning expression on the attendant's face, she remarked, "This will keep him cool all the way home." A closer examination revealed that her pet cat was resting comfortably on the chilled hot water bottle. A real cool cat!—NAII Ice News

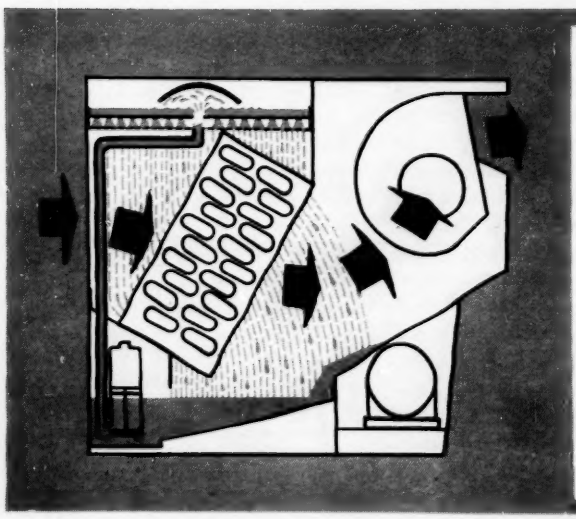
a completely new evaporative condenser design—by Carrier!



Exclusive new water distribution method requires no spray nozzles or eliminators. New lightweight, low-silhouette units ideal for roof-top installations. Easy access for servicing parts.

From Carrier, originator of the evaporative condenser, comes another major advance—an evaporative condenser completely new in design. This new unit sets new standards of efficiency in heat disposal where water supply and drainage are problems. Capacities range from 5 to 250 tons for all refrigerants. The principles and advantages of the new design are explained briefly below. For complete information, look up the Carrier dealer or branch office listed in the Classified Directory. Or write Carrier Corporation, Syracuse, New York.

AIR CONDITIONING · REFRIGERATION · INDUSTRIAL HEATING Carrier



New design features of Carrier Evaporative Condensers

Using a unique, Carrier-developed water distributing process, the new Evaporative Condensers operate without spray nozzles or eliminators. Here's how: Powerful centrifugal fans draw liberal quantities of air into the unit and over the water-drenched condensing coil. The evaporative cooling effect of the air on the water passing over the coil condenses the refrigerant vapor in the coil tubes. The liquefied refrigerant then passes from the coil and returns to the cooling system, where it is used in evaporators for air conditioning or process refrigeration.

Coil wetting is accomplished by a simple but highly effective water distributing pan arrangement above the condensing coil. Water, pumped to the top of the pan, is diffused evenly over the entire coil surface through regularly spaced orifice openings in the pan. As the metered water passes through the lower interceptor screen, it is broken into small, rainlike droplets which completely drench the coil surface. Completing the cycle, the water flows by gravity into the base pan, where it is strained before being pumped again to the water distributing pan above.

Low Temperature Research

Inyokern Test Center Produces Climatic Changes at Rocket Speeds

WANT to take a ride on a rocket? At the Naval Ordnance Test Station at Inyokern, California, you can—almost. There the York Corp., Div. of Borg-Warner has recently completed a test chamber (see *Fig.* 1) that simulates the atmospheric changes a rocket will encounter travelling through the earth's atmosphere, out into space and back to earth again. It is the only known chamber capable of creating these conditions within a matter of several minutes.

It isn't the coldest test chamber, nor is it capable of simulating a higher altitude than any other test chamber. And in size, it is relatively modest, the test space being 12 x 15 x 10 ft. high (see *Fig.* 2 and *Cover*). However, the chamber cost one million dollars and requires 2700 hp, which does take it out of the class of the ordinary.

The reason for this high cost and large horsepower is that the chamber can make accurate temperature, humidity and pressure changes faster than has ever been attempted before. For example, the chamber is required to go from a temperature of 125 F at sea level to minus 80 F and 50,000 feet altitude in 5 minutes or less, and it is required to go back to 125 F and sea level in only 33 seconds! It is also required to make simultaneous changes in temperature, humidity, and altitude between the ranges of 95 percent relative humidity and 20 percent relative humidity between the limits of 125 F Dry Bulb, and Wet Bulb temperatures above freezing. And it is able to change any combination of conditions within these limits within three minutes and fifty-one seconds. The final conditions in these changes, as well as the initial conditions, all are controlled within plus or minus 1/2 F Dry Bulb and Wet Bulb, and plus or minus 500 feet altitude.

While the rapid temperature

Fig. 1 — Loading of USN Bureau of Ordnance experimental rocket models for altitude testing is accomplished through this West side access to the environmental chamber at Inyokern, Calif. Personnel access is through the interlock on the North side (left). Test load door is a counter balanced vertical rising type, rising from a recess below the floors, and driven by the vari-speed gear motor and pulley arrangement atop the main test chamber. Heating and cooling coils are compartmented at the South side (right).

Fig. 2 — Close up of Fig. 1. Note heavy cables for lifting door. Gaskets and seating surfaces are heated to prevent condensation and subsequent freezing. Interior and envelope materials are stainless steel or Everdur, even to the window wipers. See Cover for closer view of instruments and personnel access! Controls are on East side (back) of chamber.

This article of interest to all Americans is authored by L. R. Charde, an applications engineer for York Corp., subsidiary, Borg-Warner Corp. Charde was involved in the refrigerating engineering aspects of this project, as the reader will probably become aware while reading over this interesting and detailed account.

change possible is somewhat spectacular, it is the super-fast humidity changes that make this an extra-special job, and puts this chamber in a class different from any now in existence.

Survey Points Up An Unusual Undertaking

The design of this job started with a set of performance specifications from the Navy. After checking through the performance requirements the test chamber did not look too special, or particularly difficult, other than being somewhat larger than the usual chamber. However, it was decided to make a complete survey of all test chambers in the United States, including those in operation as well as those still in the construction phase. This survey covered test chambers designed by all the manufacturers in this field.

The survey showed no other chamber in the United States even approached the design conditions of this job. York engineers then realized it would be necessary to take a step into the unknown; to try and do something that had never been attempted before. Here was a challenge to the refrigeration industry, and there was no chance for second trys if the design were wrong.

Background for Design

A background for the design was built up by contacting personnel who had experience with the general type of test chambers, including operating as well as design personnel. Performance and operating data were checked to determine the best features and the shortcomings of other chambers. Using the information obtained from these data, the design for this new type of chamber was started. After the final design was completed, the performance requirements and design calculations were once again critically checked to be sure that nothing was overlooked, as engineering involved a method which had never been tried before. As mentioned, there would be no second chance. It had to be right the first time.

At the conclusion of this final check, the design engineers knew they had gone as far as possible on paper. All of the engineering knowledge and experience available had gone into the design, and the big question remained. Is it possible to remove moisture from the air at extreme speeds and still control it accurately? The answer wouldn't be known until the chamber was completed and tested.

Basic design was to use a chamber with two coil compartments, and each coil compartment containing multiple coils which could either heat or cool. The humidity control was accomplished by means of dew point control.

It was found that the loads on the coils varied from 200 tons down to almost nothing, and these changes in load were very rapid. It was necessary for a coil to be operating under steady conditions with an air range across the coil of only 5 F. Suddenly, in a matter of seconds, the coil would have to handle an air range of as high as 200 F, and within a matter of minutes this air range would drop back to only 20 F.

Each coil would have to operate between 180 F and minus 18 F. Some of the tests required that the coils switch in the middle of the test from heating to cooling. For example, a coil might be handling a large cooling load and during one of the short five minute tests have to switch over and handle a large heating load, and again—before the test was over—switch back and handle a cooling load.

In selecting the compressor system, there were the possibilities of using either a reciprocating system (which would involve the use of rotary compressors as well as reciprocating compressors), or the use of a centrifugal compressor system. The latter was chosen due to the large loads encountered and a space restriction on equipment room. In addition, by using a centrifugal type of system, the maintenance problem was considerably reduced.

Systems Considered

Of the refrigeration systems considered, a "brine" system, a direct expansion system, or possibly a liquid recirculation system, the "brine" system best fitted the requirements. It provided a fast-acting and accurate means of controlling the rapid load changes on the coils. The temperature and humidity changes were so rapid that the coils had to be under control at all times. If a coil got out of control, there wasn't time to recover before the test was over. The "brine" system also provided a means of having coils which could either heat or cool and automatically switch from one to the other.

Another consideration in using the brine system was economics. By using a "brine" system a storage tank could be used, and by using this storage tank, the capacity of the refrigeration system was reduced by one-half. This, of course, was due to the fact that the majority of the high loads were of very short duration. Reducing the capacity of the refrigeration system by half saved the difference between a 2,000 hp and 4,000 hp system which gave a very large savings in the initial cost and eventual operating cost.

The "brine" system with a storage tank also made the centrifugal refrigeration system much simpler to operate. Since the centrifugal type of compressor is not as flexible as a reciprocating compressor, it must be balanced to meet varied load conditions and varied evaporator temperatures. Load changes on this system were so frequent and so great it would have been most difficult for an operator to keep the compressors balanced against the load. However, by using the "brine" storage tank, it was possible for the refrigeration system to operate more or less continuously, with the "brine" tank taking the tremendous surges in loads. This greatly simplified the operation of the refrigeration system.

The "brine" storage tank was also connected into the system so that it was possible to run the chamber at minus 80 F with the refrigeration system, and to start with the storage tank at a temperature of 70 F and pull it on down to minus 80 F at the same time that the chamber was being maintained at minus 80 F. This meant the storage tank would more or less float on the line and act as a constant load on the centrifugal system.

Methylene Chloride "Brine"

The "brine" selected was Refrigerant 30 (Methylene Chloride, CH_2Cl_2) as it was suitable for both the high and low temperatures. There are two complete and independent brine systems, one hot and the other cold, and the brine is never mixed between them. Each coil has a pump and automatic valves which select either hot or cold brine, depending on the demand to be satisfied and as called for by the automatic controllers.

Tanks, piping, and pumps for the cold "brine" system are of 3½ percent nickel steel. Piping in the coil circuits is also of 3½ percent nickel steel. Valves are of stainless steel and 3½ percent nickel steel. The piping, tanks, pumps and valves for the hot "brine" system are of standard construction. The cold "brine" piping is insulated with cork and the hot "brine" piping is insulated with standard magnesia. The coil piping is insulated with a multi-layer combination of magnesia and cork as this piping operates between 180 F and minus 118 F.

The hot "brine" is heated by means of a shell and tube steam heater.

Fig. 3 — View from 1000 hp. motor end of one four-stage centrifugal compressors arranged in two stage effect for refrigerating methylene chloride, the "brine" system for this low temperature research system. Other machine is at left edge of photo. Piping in foreground is to the brine heater.

Fig. 4 — Electric switchboard in machinery room which supplies compressor and pump circuits, contains main switchgear and motor controls, and serves as refrigerating plant instrument board. At extreme left is a glimpse of one high stage centrifugal Refrigerant-12 compressor.

There is no storage tank in the hot "brine" system as there was sufficient steam available to meet the maximum load requirements.

Refrigeration Apparatus

The refrigeration system is a standard compound centrifugal system using Refrigerant 12. Both the high stage and the low stage compressors have four pressure stages. A 1,000 hp motor drives the high stage unit and a 700 hp motor, the low stage machine (see *Figs.* 3 and 4). The cooler is a spray type, and there is an intercooler between the high and low stage compressors. Capacity of the system is 75 tons at minus 125 F evaporator temperature and 220 tons at a minus 37 F evaporator temperature. The 220-ton condition is required for one of the higher temperature tests.

Vacuum Pumping Equipment

The vacuum system consists of three rotary type vacuum pumps with a total 240 hp; two 100 hp (see *Fig.* 5) and one 40 hp pump. It was necessary to use a rotary type of pump for this system due to the very large volumes of air removal necessary to make the simulated fast climbs. The equipment is in a laboratory building so vibration hadt o be kept to a minimum. The rotary type of pump fitted in well with this vibration requirement as did the use of all rotary equipment.

The vacuum pumps were special in that the Navy required them to be explosion proof. This meant the standard type of lubricating oil could not be used, so *Tricreselphosphate* was decided to be the most suitable type of lubricant. This, of course, resulted in a special design for these pumps. After much trial and testing, a pump was designed which would operate on *Tricreselphosphate*.

Dive Air System

On this particular experimental site, in order to simulate sea level conditions, it is necessary to pressurize

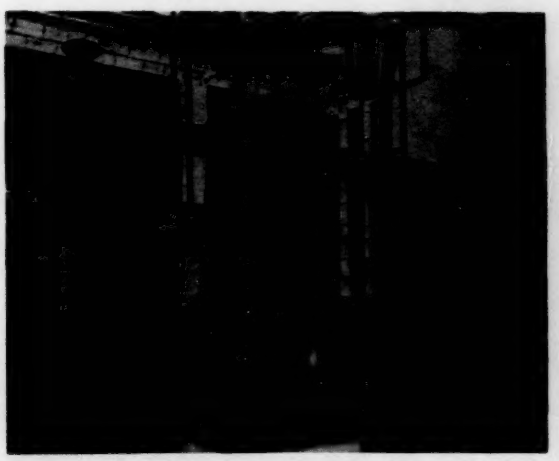


Fig. 5 — Two 100 hp vacuum pumps used to lower atmospheric pressure in the test chamber. Another 40 hp. unit helps flexibility of pumping operations. Special lubricants are used since explosive hazards are encountered.

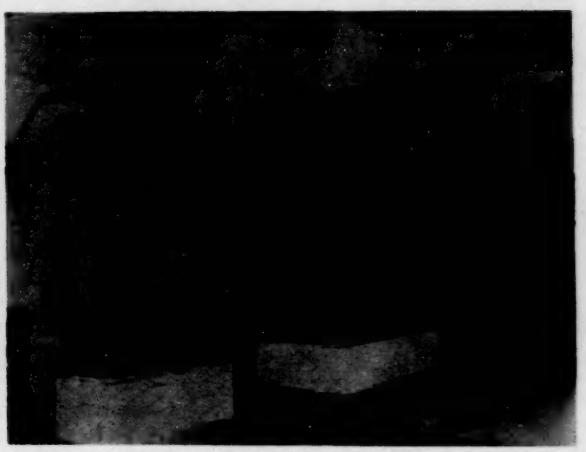


Fig. 6 — Air supplied to test chamber for simulating dive conditions is supplied by these two rotary air compressors. It is first dehumidified by the units in the right background, and then stored at 40 psig. in two tanks in left background.

the chamber since the actual elevation of the test facility is a little over 2,000 ft. The same system which supplies air to the chamber when simulating dive conditions consists of two air tanks 40 x 6 ft. dia. Air is pumped into these tanks by means of two rotary air compressors and maintained in these tanks at a pressure of 40 lbs. Air is dried before being pumped into the tanks. While it is in the tanks, air is maintained at a constant temperature by means of coils which can either heat or cool.

The air system also operates on the storage principle. To provide and install air compressors with sufficient volume to supply enough air for the rapid dives simulated in the chamber would have been very expensive. Therefore, the storage tanks handle the very large air peak demands while smaller air compressors run at a steady rate for normal demands. *Fig.* 6 shows air compressors, a storage tank, and de-humidifier.

Test Chamber Statistics

Overall dimensions of the test chamber are 28 x 18 x 28 ft. high. The pressure skin is supported by 18-in. I-beams on the outside except for the equipment door opening which is framed with 30-in. I-beams. The entire envelope of the test space is constructed of stainless steel. Electrical conduits are Everdur. (See *Figs.* 1 & 2, and *Cover*). Insulation consists of 14 layers of stainless steel sheets with wood spacers between each sheet. This type of insulation is used because of its low thermal mass and its resistance to corrosion.

The fans which circulate the air are very large and of very heavy construction due to the large air quantity required, and the high static pressure due to the deep coils. They will circulate 85,000 cfm against a static pressure of 16-in. of water. The chamber has, as is standard for most chambers, an entrance lock for personnel to enter the chamber while at an altitude condition. This entrance lock also has a small coil unit which provides any desired temperature.

In order to prevent ice from forming on the gaskets of the dampers and doors in the chamber, thus freezing them shut, a special de-icing system is provided which keeps the gasket sealing surfaces above freezing temperatures.

Controls and Instrumentation

To produce the combination of fast temperature, pressure, and humidity changes accurately was quite a control problem, and resulted in a very complex system. To illustrate extensiveness of the system, its cost was approximately $80,000. Instruments are all electronic using thermocouples for the sensing element. Each controller has a program controller so that any test can be set up on precut cans.

To highlight a few of the special features of the control system, there is a very elaborate sequence switching arrangement whereby the control point of some of the controllers is automatically switched to three difference locations during the changes of altitude. Some of the modulating control valves have special positioners as it is necessary for the valve to reverse positions eight times through the normal 15 lb. air range. It is also necessary for some of the three-way brine selector valves to operate with 180 F brine on the other.

Speed of response of the control system was of particular importance. If a test had to be started and completed within 33 seconds, it was necessary for the regulating devices to respond much faster in order to maintain control.

Particular emphasis was placed on laying out the control system for ease of operation. Controls were centralized as much as possible, and ample visual indicators were provided so that the operator knew at all times exactly what the system was doing. For central control views, see *Fig.* 7.

Performance

Start of the performance tests was the moment that everyone connected with the design of the project had waited for. At last it would then be known if it was possible to make these extreme changes so rapidly and accurately.

It was possible! It was even possible to exceed most of the requirements. The 33 second dive from 50,000 feet altitude to sea level was actually made in 17 seconds. The 5-minute climb from 125 F to minus 80 F was made in two minutes. Humidity changes were made in approximately three minutes, and it was possible to maintain the accuracy much greater than allowed in the specifications. The temperature and humidity were controlled within the width of a line on the chart and it was possible to control the altitude within plus or minus five feet. Because of the low evaporator temperatures required for the fast pull downs, it was possible to

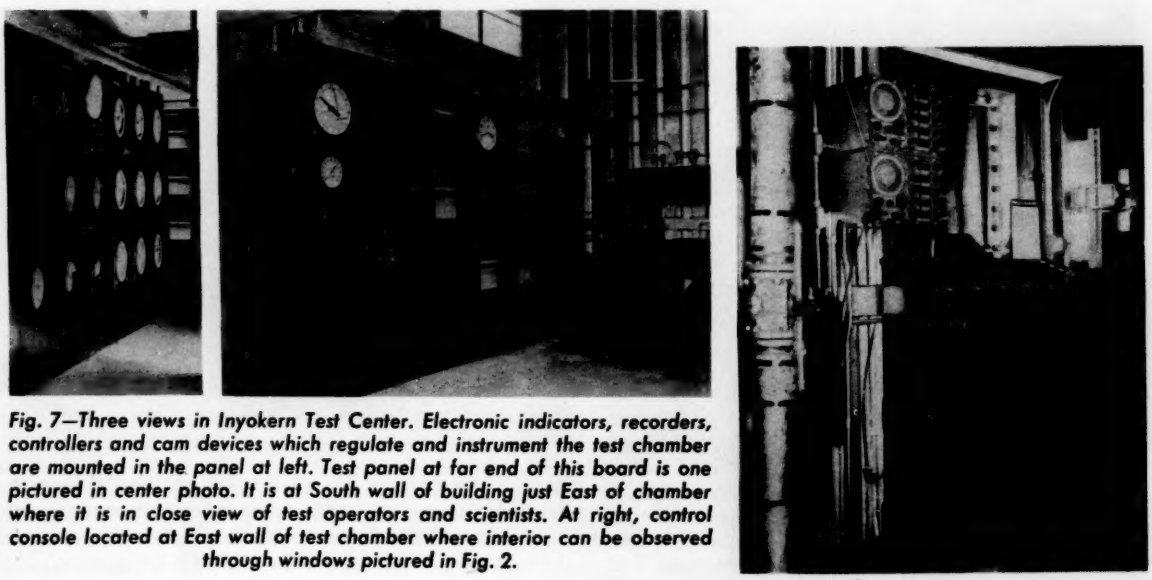


Fig. 7—Three views in Inyokern Test Center. Electronic indicators, recorders, controllers and cam devices which regulate and instrument the test chamber are mounted in the panel at left. Test panel at far end of this board is one pictured in center photo. It is at South wall of building just East of chamber where it is in close view of test operators and scientists. At right, control console located at East wall of test chamber where interior can be observed through windows pictured in Fig. 2.

hold the chamber at minus 114 F.

Although not the most difficult, the 17-second dive from 50,000 ft. to sea level was the most spectacular. This test was very close to being like the typical Hollywood-type extravaganza. The test was started with the chamber at 50,000 ft. altitude and air in the storage tanks at a pressure of 40 psig. The tanks are connected to the chamber by a 20-in. pipe with a quick opening butterfly valve. When this valve was opened, there was a tremendous roar, the indicators started spinning, lights started flashing, and the chamber rumbled and groaned. Seventeen seconds later, all was quiet, the indicators had stopped spinning, the lights stopped flashing, and the chamber was at sea level.

Although not as spectacular, the humidity changes were the most difficult. To make fast temperature and pressure changes required a lot of capacity. But to make fast humidity changes requires not only large capacity but elaborate controls, too. In changing from a high humidity condition to a low humidity condition a very heavy fog was produced, as the conditions during the change were in the super-saturated region on the psychrometric chart. The fog was so heavy that it was impossible to see in the chamber even with the polished stainless steel interior and over 3,000 watts of lighting in the test space.

Planning Pays Off

When it came to running the tests, all the planning that went into the design of the control system to provide ease of operation proved well worth while. On many of the tests the cam controllers were used, and it was necessary only to turn on a switch to run the test. The central location of the many instruments and indicator lights was of considerable assistance to the operator in checking to determine if all was in readiness for the test, and also in checking the functioning of the entire system during the tests. The fact that there were numerous large and small component systems, all of which had to be working perfectly in order to perform the test, made this feature invaluable to the operator.

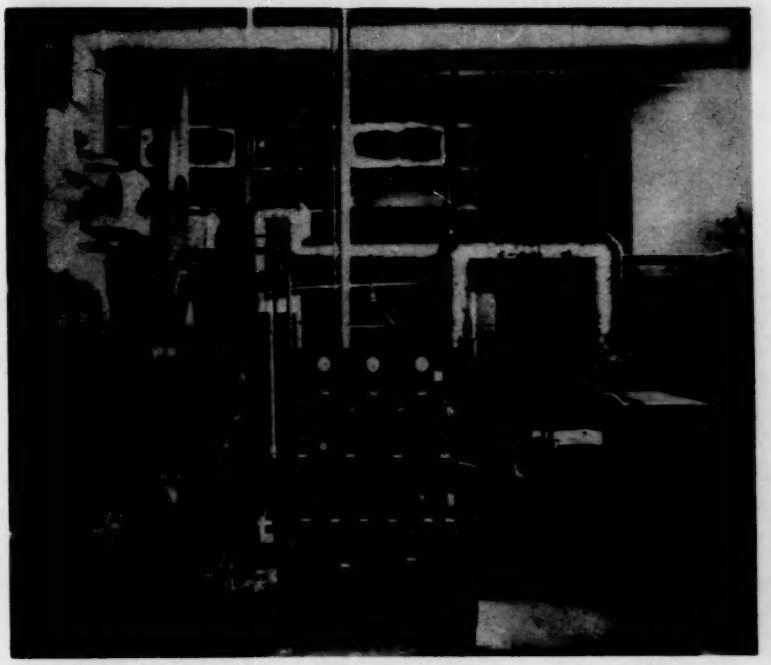
In the final analysis, it was found that the speed at which the climatic changes could be made was limited only by the speed of the controls and the temperature changes that the metal itself could withstand. By the addition of some special controls, the control speed can be still further increased, thus increasing the rates of temperature and humidity changes listed previously. Thus, the final limitation is in the materials themselves.

The Navy has found one convenience in these fast temperature changes which was not anticipated in the design. Often when the chamber is performing a test at minus 80 F, it is necessary for one of the operators to enter the chamber to make adjustments on the test object. Instead of donning heavy arctic gear, the operator merely twists a knob, and the temperature is immediately raised to 70 F. After the adjustments have been made, the operator turns the knob back again, and the temperature immediately drops back to minus 80 F and the test is resumed!

Only Chamber of Its Kind

Quite often on a project of this type, it turns out that by the time the project is designed, constructed and tested, it is obsolete and some new project is under construction which surpasses it. Recently, however, the Navy made another complete survey of all the climatic test facilities in the United States, making a complete list of their size and performance characteristics, and it was found that there is still no other facility that can duplicate the performance of this chamber.

Cincinnati Gardens Freezes Ice Floor for Ice Shows



This 50-ton chiller, manufactured by Acme Industries, Jackson, Mich., produces and maintains ice floor at the Cincinnati Gardens.

THE CREATION and maintenance of nearly one-sixth acre of 1/2 to 3/4 inch ice at famous Cincinnati Garden, Cincinnati, Ohio is a job which confronts Garden personnel at frequent intervals, since it is the home of the Mohawks, international league hockey team, and the scene of annual skating extravaganzas staged by the leading producers of ice shows in this country. Ice can't be kept on the huge floor on a continuous basis because when the Garden isn't playing host to hockey fans and ice review spectators, it usually is hosting boxing, wrestling and basketball matches, home and food shows, or one of many other types of big-scale entertainment.

The creation of ice over such a large area is a complicated procedure. The "full floating floor," built up between concrete slabs with rock cork, lead sheet and the pipe coils in consecutive layers, is first precooled by brine circulating at about 24 F. The rink is then flooded with water and the brine temperature in the piping is dropped to about 10 F for freezing and holding the ice. Once freezing is completed, the holding temperature is maintained by an Acme 50-ton chiller which cools 484 gallons per minute of the brine.

Specially Built Racks For Freezing Hams

STEWART C. JOHNSON
San Antonio, Texas

Loading specially constructed racks for freezing hams.

WE find that the use of specially constructed racks for freezing hams in multi-story operations results in more efficient and economical warehousing. The method of handling hams for freezing is a difficult one, particularly from an economical point of view in a multi-story warehouse, where it is impractical to palletize. We have found that by using specially constructed racks we can reduce our labor expense and handle the job more efficiently. This particular method might not fit your type of operation, but some version of it, I believe, could help perform the job better.

Racks to Trucks

We roll the racks up to our customers' trucks where the drivers unload the hams (usually wrapped) on to the shelves of the racks. After each rack is filled, our men pull it to the scales for weighing, counting and assigning a lot number. From here the racks are pushed onto an elevator and taken up and into the sharp freezer. When the hams are frozen without touching them they are rolled on the elevator again and moved to the "hold freezer" where they are unloaded into storage bins. Here they remain until ordered out at which time they are hand loaded into bin-type four-wheel trucks for delivery to the customer's vehicle.

The overall size of the racks is 72 inches long, 57 inches high and 24 inches wide. They are constructed of 1-1/2 inch angle iron uprights for the ends and the remainder of the frame is of 3/4 inch angle iron. Expanded metal, a heavy meshlike screen, is welded to the frame to form the shelves, which are nine inches apart, with a capacity of 112 hams of the 10 to 12 lb. size and 98 hams of the 16 to 18 pound size. A handle of 1 inch pipe is welded on one end and it extends two and one-half inches from the frame. On the handle end of the rack we have two 5 inch casters and on the other end two 5 inch rigid casters, thus enabling one man to operate easily. We used enamel paint on our racks at first, but experience has shown us that a rustoleum primer holds up much better.

Empty Racks Stored

Empty racks are stored in a cooler of approximately 30 F to prevent sweating, rusting, and keeps them cool so there is no delay when needed. Most of our customers' hams arrive at our warehouse wrapped. However, we have received them without wrapping and in those cases it is necessary to place a heavy wax paper over the shelves to prevent sticking. The racks were built in our shop and have required no repairs to date, except painting.

Effect of Reflective Surfaces on Insulating

A PUBLICATION issued by The National Bureau of Standards, "Thermal Resistance of Airspaces and Fibrous Insulations Bounded by Reflective Surfaces," written by H. E. Robinson, L. A. Cosgrove, and F. J. Powell, issued November 14, 1957, provides a quantitative answer to a question long posed by architects, builders and the construction industry; what are the effects or improvements of reflective surfaces on the insulating value of air spaces or fibrous materials in buildings? The answer is given in the results of a recent research program conducted by the National Bureau of Standards and the Aluminum Company of America under the Bureau's cooperative research associateship plan.

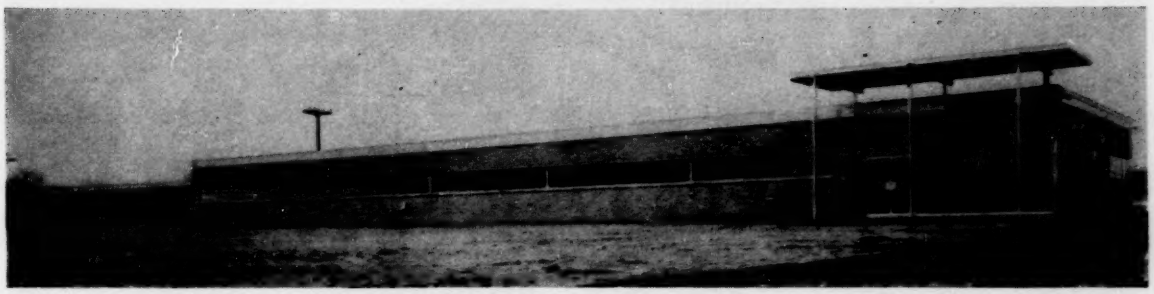
The study shows that air spaces in buildings give better insulation if they are surfaced on one side or subdivided with highly reflective surfaces such as aluminum foil. In addition, the use of reflective surfaces on typical fibrous insulating materials of blanket, batt, or board form installed with adjoining air spaces materially increases their insulating effect, especially where the direction of heat flow is downward.

The heat transfer measurements were made on test panels in a rotatable guarded hot box apparatus. The test procedure and the equipment used are described in the report. Results of the investigation are presented in terms of thermal resistance, because resistances are additive for tandem components, and they are the quantities actually used in the most computations of the insulating effect of constructions. An appendix contains the method of calculating airspace conductances, and lists the range of experimental conditions at which convection-conduction coefficients were determined.

National Conference on Materials Handling

A NATIONAL conference on materials handling, the first to be sponsored by the American Society of Mechanical Engineers since 1949, has been announced by John G. Somers, chairman of the society's materials handling division and president of Industrial Products Engineering Co., Long Island City, N. Y. The conference will be held in conjunction with the National Materials Handling Exposition at the Public Auditorium, Cleveland, June 9 to 12, 1958.

American Coils Follows A Trend–Sets Another



New "de-urbanized" location of American Coils Co. at Farmingdale, N. J. Water-to-air heat pump provides year-round space conditioning throughout.

ONE FIRM with more than enough reason to view the industrial "deurbanization" trend with favor is the American Coils Co., which early this year moved its manufacturing and executive headquarters from Newark, N. J., population 500,000, to Farmingdale, N. J., population less than 1,000. By "de-urbanizing" its own operation, American Coils has doubled its present productive capacity while establishing a future growth potential.

Biggest problem in the firm's old Newark headquarters was building space. Not only was there not enough of it but what there was could not be efficiently utilized. Floor space in the firm's former three-story building was at such a premium that even the loss of the small amount of space required by inter-floor conveyors could not have been tolerated. The cost of modernizing the building would have been prohibitively high.

Factors responsible for the firm's choice of Farmingdale for its new 11-acre site were the excellence of both east-west and north-south transportation facilities, both rail and highway, its convenience to Newark (only 45 miles away) and New York which meant that the move could be made rapidly and economically without disrupting existing distribution channels; the community's willingness to welcome new industry; availability of labor; and, a good water supply. The latter was important because water-to-air heat pumps were decided on at an early stage for year-round air conditioning.

Packaged Heat Pump Systems Sets Important Precedent

Below freezing temperatures have not proved a barrier to the realization of heat pump advantages for the new American Coils Co. plant. The company regards its multi-unit heating and cooling system as a complete success, and has hailed it as an important step forward in the practical application of air conditioning principles. For, as it was explained by American Coils president Michael Parcaro, the heat pump, although laden with advantages for industrial, commercial and residential users, has been considered "impractical" in most of the more heavily populated and industrialized northerly areas. Behind this seeming paradox, Parcaro said, is the inability of the conventional air-to-air heat pump to supply adequate warmth in colder areas without supplementary heating equipment.

The American Coils system passed its first severe test early in 1957 when outdoor temperatures dropped to 6F during a week long cold wave. The pumps, operating at only 60 percent of capacity, kept the new 63,000 foot building at 70 to 72F. Heating costs during the cold wave were substantially less than they would have been with a conventional steam heat system under similar circumstances.

Production Factors Cited

In designing their new plant, American Coils Co. gave particular attention to facilitating the flow of raw materials and component parts through all stages of the manufacturing and assembly processes, and provided for maximum expansion. Results show that these two design considerations have been met. Daily production has substantially increased over old levels–the increase directly attributable to ease of materials handling. Without adding an inch of

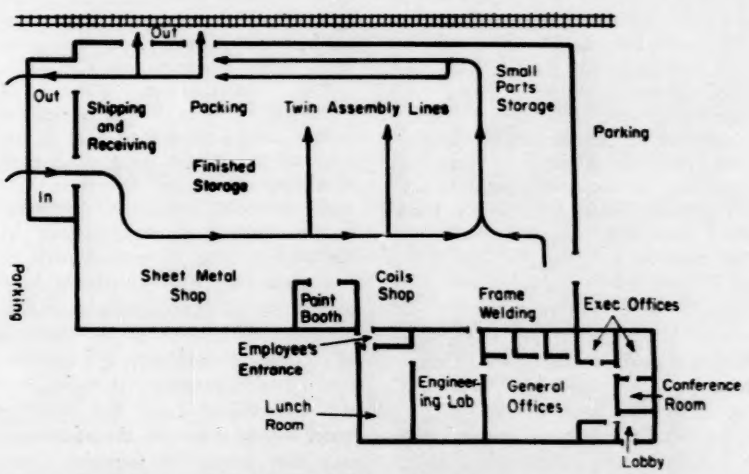


Fig. 1—First factor in doubling production over previous effort given by American Coils officials is the single-story "U"-flow manufacturing and assembly line.

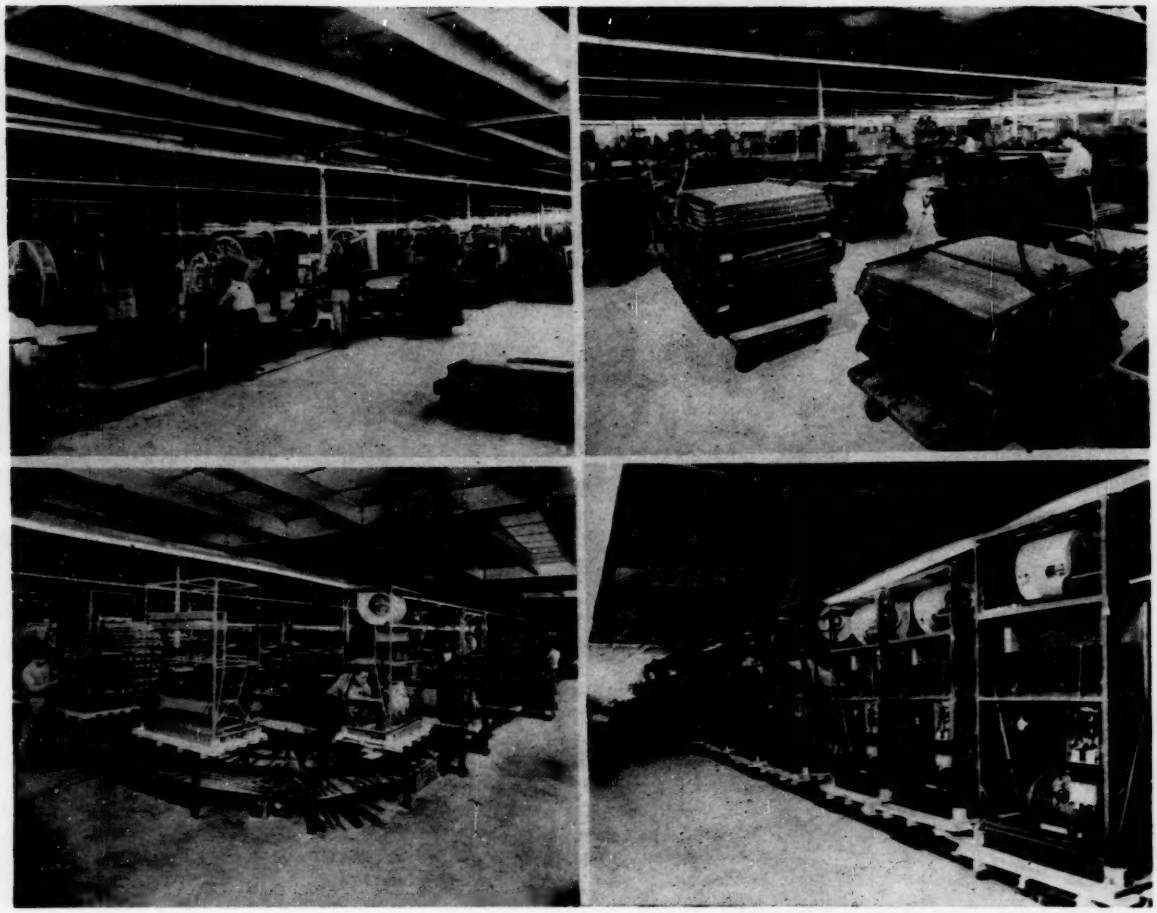


Fig. 2—Views of manufacturing phases in the production of packaged air conditioners. Upper left: Heavy power equipment forms sheet metal panels from sheets and cuts angle iron to size for rigid frames. Upper right: Completed evaporator coils are readied for the assembly line. Lower left: Major assembly consists of mounting compressor to steel frame base, blowers and coils to the upper frame, plus installation of smaller parts and electrical components. Lower right: Charged and tested units await final assembly of Fiberglas insulated sheet metal panels.

production space, present output can be doubled. Therefore, American Coils is equipped to promptly service all types of air conditioning and refrigeration buyers.

Three principal factors were singled out as contributing to the production boost. Possibly the most important, say American Coils production men, is single-story materials handling. In the new plant, raw materials enter from a three-bay truck dock (see Fig. 1), sweep through the plant in a broad "U" and leave as finished units from either the same truck dock or a railroad siding. The change from multi- to single-story flow also saved on manpower. Twelve men formerly required for multi-floor handling have been eliminated.

Second factor is space coupled with a flexible power distribution system. Enough room is allowed on the production floor for the addition of considerable equipment, or for rearrangement of existing equipment. In either instance, power can be supplied quickly and economically from plug-in bus ducts hung from structural steel ceiling supports (see Fig. 3).

Third important factor is the use of packaged water-to-air heat pumps for both heating and cooling. Use of this type of air conditioning equipment eliminates the need for duct-work and provides maximum flexibility in the setting of temperatures to the requirements of various parts of the plant (see Fig. 4). If the heat load in the manufacturing area should be increased because of the addition of production machinery and employees, it is only necessary to make piping connections from the existing water supply system to the additional unit that might be required. Leeway in day-to-day production is made possible by the packaged installation also. It is possible for the company to shut down the units that condition the general office areas while those in the manufacturing area run straight through the night—allowing production to run on a three shift basis with adequate air conditioning.

Extracts Heat From Water

American Coils, 123 total hp, packaged system uses well water as a source of heat. It takes advantage of the fact that water under ground will remain at a relatively stable temperature well above freezing, even when outside temperatures nosedive to below zero. The water-to-air heat pumps are effective with well water temperatures as low as 50°F. The heat pumps will also perform more efficiently during summer months as well water temperatures will remain far below outdoor air temperatures. This means that compressors will not be called on to labor due to exces-

Fig. 3—Plug-in type power take-off busses such as shown here, provide for production and expansion flexibility.

sive ambients. Overloads are materially reduced; longer compressor life with less maintenance can be expected.

Water for the heat pump system is supplied by a 505 ft. deep-well which has a capacity of 350 gpm delivered at 60 psig, and is located just outside the plant building. A 10,000 gallon capacity storage tank installed underground permits each heat pump to be equipped with automatic water-saving valves. The reservoir also provides ample water for domestic purposes and fire protection. Water is available in the plant at 40 to 60 psig and is supplied to the individual heat pumps through all copper piping buried in the concrete floors. Water return lines are also of copper and they connect each heat pump to a central 12-inch tile drain.

The storage tank itself is covered with two feet of earth which is in turn covered with black top. This prevents any temperature rise or drop in the water contained in the tank. Thirty-six feet long, the tank is of all steel construction, ASME coded and is coated inside with a material designed to prevent accumulation of scale or mineral deposits.

American Coils realistically cautions prospective users of water-to-air heat pumps that in some instances there may not be sufficient water available for efficient operation. "The water-to-air heat pump," says the firm's sales manager, Pete Hatcher, "is not an out-and-out substitute for air-to-air units." However, a water-to-air heat pump is considered superior to other year-round air conditioning arrangements where ample water is available. The company advises prospective users to write their state governments, requesting a water table map of their area when considering use of water-to-air heat pumps.

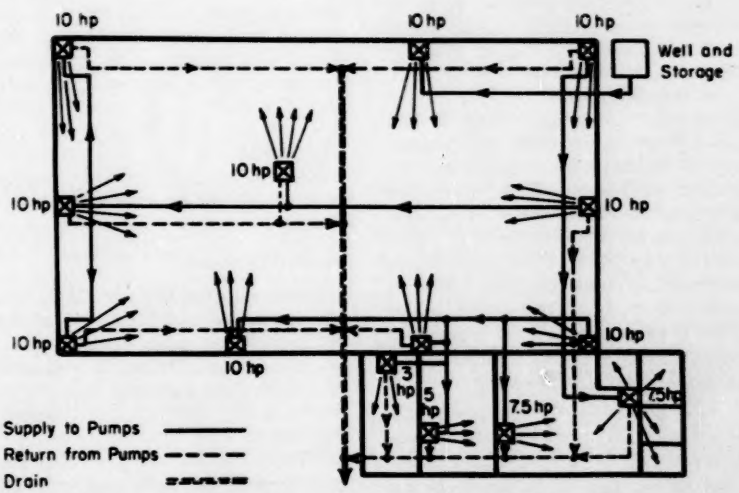


Fig. 4—Location of individual reversible evaporator-condenser refrigeration units in packaged space conditioning units, provides variable, ductless heating or cooling as required in plant or offices. Stored well water is heat source.

Uses 14-Packaged Units

Altogether, there are 14 ACI-H water-to-air heat pump units in the ACI plant. Ten are 10 hp units located in the building's 54,000 square feet of unpartitioned manufacturing, shipping and receiving space. A 3-hp unit serves in employees' lunch room; a single 5-hp pump is located in the engineering lab; and, two units, each rated at 7½ hp supply conditioned air for the general offices, executive offices, conference room and lobby, a total area of 9,000 sq. ft. Total capacity for winter operation is 2,000,000 Btus; for summer cooling, the system is rated at 1,470,000 Btus. The combined heat pumps are capable of extracting 1,500-gallons of water from the air per day giving more than adequate humidity control.

ASHAE To Hold Annual Meeting

SEVEN technical sessions, consisting of 17 papers and two symposiums comprise the program for the 64th annual meeting of the American Society of Heating and Air-Conditioning Engineers, January 27-29, 1958, Penn-Sheraton Hotel, Pittsburgh, Pa.

Allison R. Maxwell, Jr., president of Pittsburgh Steel Company is to deliver the address at the Annual Banquet and his subject is What Steel Stability Means to You. The awarding of the ASHAE F. Paul Anderson Medal and the presentation of the Past President's Award to Pres. P. B. Gordon also are features of the Annual Banquet.

An address by Mayor David L. Lawrence titled Pittsburgh, A City Where Dreams Come True, and the presentation of Fellow Grade Certificates to eight outstanding Society members are major events of the Welcome Luncheon Monday, January 27 at 12:30.

The Committee on Arrangements is organizing many special events including inspection trips to Homestead Steel Works, Gulf Oil Corp. Research Laboratories, Pittsburgh Consolidated Coal Co., and the Alcoa Building.

Air Conditioning—It's Growth and Impact on American Life and Economy

THE modern miracle of mechanical refrigeration, and its spectacular offspring, air-conditioning, became more firmly entrenched as integral parts of life in America during 1957, and the industry producing them looks forward to a new year of even greater public awareness of their contributions to health, comfort, industrial development, and national defense, Geo. S. Jones, Jr., Managing Director of the Air-Conditioning and Refrigeration Institute, said in a year-end statement.

To stimulate this awareness on the part of the public, which will result in inevitable growth of the industry represented by the Institute, ARI and its members will continue and increase efforts to call attention to the benefits of mechanical cooling—whether it be applied to industrial processes, electronic 'brains', ICBM developments, the millions of tons of food in America's refrigerated warehouses, or the comfort cooling of the American home, store, shop office and factory, Mr. Jones said.

While sales of residential air-conditioning equipment in 1957 did not reach the heights forecast early in the year, they were still substantially above any year prior to 1956, and only a few percentage points below that year. Sales of room units for 1957 were estimated at 1,500,000, about 100,000 less than in the previous year, and central residential installations were approximately equal to those in 1956—around 150,000. Cool summer weather over many sections of the country was partially responsible for this leveling off of sales which had been showing sharp increases each year during the decade ending in 1956, the ARI spokesman said.

Industrial Installations

However, while residential installations and room air-conditioner sales took a breather during the year, installations in commercial and industrial establishments continued their climb, ARI said, basing its conclusion on reports from most of the major makers and installers of such equipment. While complete figures are not available at this time, it is estimated that the 1957 figure for installed cost of large systems will run well ahead of the 1956 total of $556,670,000, which was $120,000,000 more than the 1955 figure.

Meanwhile, development of new marketing methods for foods led the commercial refrigeration industry to design and manufacture new types of equipment for displaying and merchandising frozen foods and those requiring refrigeration, which now make up almost 75 per cent of our national diet.

Highlights in the refrigeration and air-conditioning picture for 1957 as seen in retrospect included the following, all of which have a direct bearing on the industry's future:

Highlights in Picture

1. A Government-Industry symposium on air-conditioning, held at the U. S. Commerce Department in April, at which leaders in the industry and government officials concerned with air-conditioning discussed common problems. At this meeting a government spokesman indicated that virtually all future government buildings will be air-conditioned for comfort and efficiency of employees. Industry spokesmen pointed out the positive dollars-and-cents advantages of air-conditioning from the standpoints of employee efficiency and materials and process control.

2. Inauguration of a program of rating room air-conditioners in terms of British thermal units in accordance with ARI Standards, providing the public with a standard method of comparing cooling capacities of units offered for sale. This program is to be extended to other types of equipment offered the public under ARI programs now under development.

3. Announcement by Federal Housing Administration that it had "eased" its regulations with respect to air-conditioning equipment installed in homes whose mortgages are guaranteed by FHA. This new policy is expected to lead to inclusion by builders of air-conditioning in many new homes from which it might have been eliminated under FHA's earlier policy of penalizing air-conditioning in making evaluations of property for loan purposes.

4. A "round-table" discussion participated in by builders and representatives of the industry, held under joint sponsorship of House & Home magazine and ARI, at which the merchandising of new air-conditioned homes was discussed at length. Both ARI and National Association of Home Builders have appointed committees which will work together to the end of selling the idea of air-conditioned homes to the public.

5. The 10th Exposition of the Air-Conditioning and Refrigeration Industry, sponsored by ARI at the International Amphitheatre in Chicago in November, at which manufacturers displayed literally hundreds of new developments, from component parts to new end-products, designed to make air-conditioning and refrigeration more efficient and more desirable at all levels and for many uses.

6. Revelation that jet aircraft, radar, electronic computers, rockets and other missiles, and many other items of which have not only become a part of our civilian economy but are essential to national defense, utilize refrigeration or air-conditioning, or both, in their manufacture, operation and control. This has resulted in the development of many new applications of the principle of mechanical refrigeration.

Heat Pumps Produced

7. Increased interest in the manufacture of heat pumps marked 1957, it was pointed out, and these are expected to become a larger factor in the production of many companies in 1958 and ensuing years. Many manufacturers are applying the "reverse cycle" heat pump principle to room-size units, and many others are building large industrial heat pumps which will cool in summer and heat in winter without the combustion of fuel on the premises.

8. Gas-fired air-conditioning made new gains, leading some authorities to predict that it will become an increasing factor in the industry in the coming years, thus opening up new fields. The American Gas Association has underway a large-scale research and development program, coupled with promotional efforts to sell gas air-conditioning. The fuel oil industry, too, is seeking to develop equipment using oil to generate air-conditioning.

Future Outlook

Pointing to the 1957 developments, Mr. Jones said that the future of the industry seems even rosier than at the end of 1956, when it was able to report sales increases but not so much in the way of developments pointing to an expanding future.

"We of the industry feel that the strides made in 1957, not only by our own member companies but by those industries and individuals who

(Continued on page 52)

Scientists Discuss Low Temperature Applications at Cryogenic Conference

WITH more than 500 engineers and scientists in attendance, the 1957 Cryogenic Engineering Conference met at the Boulder Laboratories of the National Bureau of Standards, August 19-21. The large attendance and the broad variety of researches discussed in the 44 delivered papers gave evidence that the low-temperature field continues to attract increasing attention from industry and defense. The papers dealt not only with recent low-temperature engineering techniques and experimental discoveries, but also with the theoretical problems of low-temperature research.

The meeting was called to order by R. B. Scott, Chief of the NBS Cryogenic Engineering Laboratory; and Dr. F. W. Brown, Director of the Boulder Laboratories, greeted the participants in a brief introductory talk. The researches reported to the Conference fell into 4 major categories that dealt, respectively, with cryogenic processes, applications, equipment, and properties.

Processes

Although the process of low temperature refrigeration and gas separation was worked out nearly a half century ago, important improvements are still being developed, conference papers brought out, with the result that liquefaction processes are becoming more efficient and less expensive. The most striking recent illustration of this fact was described in a series of papers on the use of the catalyst, hydrous-ferric oxide, to convert liquid hydrogen from the ortho to para state during liquefaction. As a result, the liquid is not evaporated by conversion which would otherwise take place in the storage vessel.[1]

C. R. Class, R. P. Spero, and G. E. McIntosh (Beech Aircraft Corp.), told of a theoretical study that showed how catalysts, when properly located to convert ortho- to parahydrogen in the gas phase of a parahydrogen liquefaction cycle, are more effective in increasing yield than either minor-cycle modification or major-expansion engine improvement.

Design data for ortho-parahydrogen converters were presented by D. H. Weitzel, C. C. VanValin, and J. W. Draper of the NBS Cryogenic Engineering Laboratory. They pointed out that the most important variables in such designs are the conditions of temperature, pressure, feed composition, and space velocity (or contact time) under which the conversion proceeds.

W. A. Wilson of NBS in cooperation with D. H. Weitzel, then showed the favorable comparison between the laboratory-scale studies and results obtained in the large Bureau liquefier when a vapor-phase converter was used operating in a 71 degree K bath. It was pointed out that conversion at higher temperature provides increased liquefaction-cycle efficiency.

T. W. Schaffers (North American Philips Co.) described a gas liquefier of non-conventional design and modest cost which can produce five quarts of liquid air an hour.

Applications

In the discussions devoted to cryogenic applications, R. E. Brown (Navy Bureau of Aeronautics) expressed the opinion that helium could be conveniently liquefied at production plants so it could be shipped by air or tank cars to points of use. The cost of transporting helium as a liquid, he pointed out, is about one-fifth the cost of transporting the same amount of it as a high pressure gas. The Navy Department is critically concerned with achieving the most economical production and transportation of helium since it requires large quantities for a wide variety of uses including welding and airship inflation, and for its role in the nation's missile program.

For some time the Bureau has been investigating the technical feasibility of such a plan as that proposed by Mr. Brown. The Boulder Laboratories have worked out designs for a railroad tank car capable of transporting 60,000 liters (15,000 gallons) of helium as a liquid.

At Air Products, Inc., a large-scale liquid oxygen and liquid nitrogen unit has been developed to satisfy requirements of the Air Force missile program, according to a paper delivered by W. J. Scharle. The unit has a high efficiency with consequent low operating cost, minimum utility requirements (including no water consumption) and maximum mobility compatible with large-scale liquid production. The production rate of the unit is 56,000 liters per day of liquid oxygen plus 8000 liters per day of liquid nitrogen, each at 99.5 per cent purity.

W. W. Aton (Linde Co.) told of unattended oxygen plants that range in capacity from less than 10 million cubic feet to more than 100 million cubic feet per month. These plants function in conjunction with liquid oxygen storage supply facilities that consist of a storage tank and the required auxiliaries for pressurizing, vaporizing, and delivering gaseous oxygen into the customer's pipe line.

A break-through on a problem that has challenged cryogenic scientists for some time was announced by S. Greenfield of Rocketdyne. Rocket engineers there have found a solution to the problem of keeping the pressurizing gas, nitrogen, from mixing with the liquid oxygen used as a propellant.

Working under an Air Force contract, Rocketdyne has designed a perforated inlet tube that slows down the nitrogen as it is diffused into the liquid oxygen chamber. Instead of mixing with the liquid oxygen, the nitrogen bounces against the top of the tank and then gently blankets the liquid.

It was stated that 10 to 20 times less dilution takes place with the new inlet tube. This may increase the range of long-range rocket-powered missiles by as much as 30 per cent. It is also planned to try replacing the perforated tube with a tube made of metal mesh; the indications are that this tube will be even more effective.

Equipment

The fourteen papers delivered on cryogenic equipment included discussions of the use of liquid helium in an atomic reactor in order to study radiation effects at extremely low temperatures; piston-type high pressure aircraft cryogenic pumps; and a cryostat for liquid nitrogen cooling of rocket-borne photomultiplier tubes.

V. E. Isakson, C. D. Holben, and C. V. Fogelberg (Beech Aircraft Corp.) reported on a large-size, non-refrigerated vessel that stores and transports liquid hydrogen. This vessel is insulated with evaculated powders and does not use a radiation shield. Heat leak calculations predict

[1]Catalyst for parahydrogen production, NBS Tech. News Bul. 41, 154 (Oct. 1957).

loss rates of about 2% per day; measured values are somewhat less. The dewar is mounted on a semitrailer chassis, but it can be removed where a skid-mounted dewar is required.

The fact that no one thermometer is suitable from the entire temperature range of 1 degree to 300 degree K, led to a study reported by R. D. Goodwin of the Boulder Laboratories. His experiments show that thermometer power may be reduced by using unsymmetrical resistance bridges, by using specific bridge circuits in conjunction with various types of thermometers, and by matching the bridge source and detector input impedances.

Cryogenic Properties

Among the more than a dozen papers on the topic of cryogenic properties the one by R. M. McClintock and M. J. Hiza (NBS) described the properties of a filled-epoxy resin adhesive which has been found capable of holding light metals together with a strength of 800 psi at a temperature of 20 degree K. The research was necessitated when design of a liquid-hydrogen cooled electro-magnet being developed at Los Alamos Scientific Laboratory required that copper coils be joined with a resin. These coils are subjected to sudden and extreme decreases in temperature, so that a resin was needed that would contract in the same ratio as the copper parts that bonded together.

S. C. Huntley (NACA) discussed the problem of heat leak associated with increase in pressure when cryogenic liquids are enclosed in a container. He reported on an experimental study that determined the factors controlling pressure rise in a closed liquid-nitrogen container. Liquid and vapor temperatures were measured in a 30 by 93 inch dewar as the container was allowed to pressurize with time. Heat leak rate was controlled by varying vacuum pressure in the jacket of the dewar. Liquid level was varied from one-third to two-thirds of container capacity.

It was shown that, because of free convection, a liquid temperature gradient exists which becomes more severe with time; the free surface temperature controls the pressure; and, mixing the liquid extended the time required to reach limiting pressure. It was also shown that the temperature gradient exists in the vapor and mixing the vapor may result in a substantial increase in pressure.

Other papers on cryogenic properties dealt with such topics as "Calculation of Gaseous Heat Conduction in Dewars", "Measurements of Thermal Stresses at minus 320 degrees F by Strain Gages", and "Friction Studies of Various Materials in Liquid Nitrogen".

A highlight of the Conference was the banquet address delivered by C. J. Gorter, Director of the Kammerlingh Onnes Laboratory in Leiden. He invited all participants to attend the low-temperature conferences to be held next year in The Netherlands at the University of Delft (June 18-20) and at the University of Leiden (June 23-28). The conferences will commemorate the 50th anniversary of the first liquefaction of helium, accomplished by the Dutch scientist, Prof. Kammerlingh Onnes.

It was announced at the close of the sessions that the 1958 Cryogenic Engineering Conference will be held September 3-5 at the Massachusetts Institute of Technology. The invitation for the meeting was extended by Professor S. C. Collins, head of the MIT cryogenic engineering laboratory.

Report on Performance of Refrigerated Rail Cars

A REPORT has been issued on a study of the comparative performances of two types of mechanical refrigerated rail cars and a standard water-ice and salt refrigerated car hauling packaged frozen corn from Watseka, Minn., to Jersey City, N. J. The study was made by the Marketing Research Division, United States Department of Agriculture, under direction of Russell H. Hinds, Jr., Harold D. Johnson, and Robert C. Haldeman.

Performances are measured in terms of precooling time, air and commodity temperatures within the cars and out-of-pocket refrigeration costs.

In the mechanical refrigerator cars precooling times varied widely; one car required approximately seven hours, the other 16 hours to reduce interior car temperatures to 0 F. Contributing to this was the difference in the refrigerating capacities of the cars. At 100 ambient temperature and 0 F interior temperatures, one car was rated at 52,000 British thermal units per hour compared with 32,000 Btu/hr. in the other. No precooling test was conducted on the water-ice car since it was not available for instrumentation before initial icing.

Comparatively high and variable temperatures were recorded in the water-ice-salt car. During transit, the refrigerating system absorbed only a very small part of the heat gained by the commodity during loading and while on origin siding. The commodity temperature had increased from 0 F to an average of 14.6 F upon completion of loading. Air temperatures were well above the desired 0 F level. At destination the average commodity temperature of the test packages was 14.3 F, approximately the same level at which the commodity left Watseka.

The transit test for both mechanical cars was divided into two parts: the first with thermostats set at 0 F., and the second with thermostats lowered to minus 10 F. The object was to check further the capacities of the refrigerating units. During the first part of the transit test, air and commodity temperatures changed little. The fact that thermosats were not identically calibrated resulted in some variance in temperatures between the cars, but recorded commodity temperatures were within a satisfactory range. On the second part of the trip, temperatures declined rapidly in both cars indicating the refrigeration systems had ample reserve capacity and were capable of maintaining 0 F temperatures.

During the tests, the twin engines in one of the mechanical cars operating intermittently a total of 112 hours. They consumed 123.5 gallons of fuel, at an estimated cost of $19.76. In the second mechanical car, the single engine operated continuously for 130.9 hours and consumed 97.4 gallons of fuel at an estimated cost of $15.58. Contributing to this difference in fuel consumption was the greater capacity of the refrigeration system in the first car, the greater cargo load, and the fact that somewhat lower average temperatures were maintained in it. Seventeen tons of ice and five tons of salt were put in the ice car bunkers. At railroad tariff rates the charges for that amount of ice and salt would have been $214.97. Actual railroad costs for ice and salt are not known.

Consumption of fuel, ice, and salt represents only one of many factors in total operating costs. The original cost of the mechanically refrigerated car is much higher than the standard ice bunker car, and the cost of amortization over its service life undoubtedly would be considerably greater. Maintenance costs of mechanical cars may be assumed to be higher than for ice cars.

Report on Freezing Points of Fruits and Vegetables And Florist Stocks

GROWERS, cold storage operators, and others involved in marketing fruits, vegetables, and florist stocks are always concerned about freezing damage. They know there's a good chance that products they handle may freeze in the field in cold weather or during marketing.

That's why a soon-to-be-released marketing research report on "Freezing Points of Fruits, Vegetables, and Florist Stocks" can serve as a valuable guide for those who handle these items.

AMS horticulturist T. M. Whiteman of the Plant Industry Station, Beltsville, Md., has collected freezing point data for about 600 different products and varieties. Included are 37 kinds and varieties of citrus fruits, 17 apple varieties, and 11 varieties of potatoes.

Standard commercial varieties and new varieties were tested. Thousands of samples were used to determine the freezing points.

In a number of cases, freezing points were determined for different parts of the same commodity: for example, the peel and flesh of bananas, tops and roots of beets, flesh and rind of citrus fruits, and the crowns and roots of strawberry plants.

High, low, and average freezing points were determined, but the highest freezing point is considered the best guide for avoiding freezing injury.

Freezing Points Vary

Freezing points vary for different kinds and varieties of products. The lowest freezing point among the common fresh fruits was 25.5° F., for Seckel pears. Soft-ripe Booth 7 avocados had the highest freezing point, 31.5°. Of the fresh vegetables, horseradish roots had the lowest freezing point, 28.1°, and broad-leaved endive had the highest, 31.9°.

The freezing points of fruits tended to be lower than those of vegetables, probably because fruits have a higher soluble solids contents, principally sugars.

In some cases freezing points of different varieties of the same product vary considerably. This is true of oranges. In the 14 varieties tested, freezing points of the flesh ranged from 27.4° to 30.6° F. So, each variety of a fruit like this should be considered separately.

It is possible for the temperature of a product to drop below its freezing point without freezing. In other words, ice crystals do not form. This is called supercooling. If this accidentally happens, it is advisable to raise the room temperature and avoid disturbing the commodity. Doors should be closed gently, and floors should not be jarred. Damage may be held down if the products warm up without ice being formed in their tissues.

Mr. Whiteman used thermocouples and an electronic recording instrument to determine the freezing points. Samples were set up in a room held at 20° F. One thermocouple, 2 small wires joined at one end, was inserted at least 1/2 inch into each sample. Small samples like cranberries and grapes received special treatment. They were cut or chopped and placed in aluminum foil bundles.

The thermocouple wires were connected to the recorder in an unrefrigerated room. This instrument can handle 20 thermocouples. One thermocouple was placed at a contsant 32° F. temperature as a continuous check on the instrument. So, as many as 19 thermocouples could be used for the individual specimens or composite bundles.

With the instrument registering the temperature of one sample every 30 seconds, the temperature of each specimen was recorded every 10 minutes.

The freezing point of the product was determined by studying the temperatures recorded on graph paper. As freezing begins, heat is released and the temperature of the sample rises. The rise is followed by a leveling off. The first constant temperature is usually taken to be the freezing point of the products. AGRICULTURAL MARKETING

Metal Containers for Frozen Fruits

ACCORDING to reports, Snow Crop Division of Minute Maid Corp. is considering metal containers for its entire production of frozen fruits following a 40 percent sales increase of sliced strawberries in 1956. Advantages have been apparent in the TTT project and was pointed out over 25 years ago by the Director when he was in charge of frozen food research for USDA in the Pacific Northwest, which has shown that in present commercial experience, the container that allows air to penetrate or contains too much air when filled is at a disadvantage for fruits and especially for light-colored fruits.—TRRF Bulletin.

1957 Frozen Peach Pack Shows Slight Decline

THIS season's pack of frozen peaches amounted to 43,190,602 pounds according to a survey completed by the National Association of Frozen Food Packers. This represents a 5 percent decrease from last year's pack which was second only to the 50.6 million pound record in 1955.

Regional production generally followed the usual pattern with the West accounting for around three-fourths of the total pack. Production in the Northeast and South remained about the same. After its severe decline in 1956, the Midwest pack climbed back to something like its normal historical position.

TOTAL UNITED STATES PACK IN PAST YEARS

Year	*Pounds*
1942	13,801,217
1943	17,008,527
1944	45,562,689
1945	103,634,388
1946	65,140,192
1947	27,034,119
1948	13,598,338
1949	23,234,608
1950	25,790,592
1951	32,380,150
1952	35,454,390
1953	32,170,960
1954	36,379,902
1955	50,635,491
1956	45,480,724

1957 Pack Frozen Cut Corn

THIS year's pack of frozen cut corn amounted to 112,201,599 pounds, according to a survey recently completed by the National Association of Frozen Food Packers. This is second only to the 1956 all time record pack of 118.2 million pounds. And it is still 7 percent greater than the next largest pack of 104.8 million pounds in 1953.

Production in the East and South showed a sharp 33 percent decline over that of last year. However, this appears to be primarily a return to previous historical volume. Western production, traditionally large proportionately, was up about 4 percent. A smaller increase was noted in the Midwest.

Near disappearance of retail packages other than the 10 ounce indicates acceptance of this as the standard container. While the pack in small institutional sizes declined this year, a continuing trend was noted in the considerable increase in the large, predominantly 55 and 60 pound, industrial container usage.

Advisory Group Urges Wide Use of T-T-T Information

A RECOMMENDATION that the U. S. Department of Agriculture encourage the widest possible use of the valuable information being developed by its time-temperature tolerance research in frozen foods was made by the Department's Refrigerated and Frozen Products Research Advisory Committee at its annual meeting in Washington November 12-14.

The time-temperature tolerance studies, being conducted by USDA's Western Utilization Research and Development Division at Albany, Calif., are uncovering the relationships between quality factors in frozen foods and various temperature levels and storage times.

The committee commended USDA for its frozen food display illustrating time-temperature findings made so far, which was shown at the Frozen Food Distributor's Association meeting in Chicago last September, and urged expanded dissemination of the same information.

In this connection, the group gave high priority to a research proposal to develop new or improved methods and instruments for evaluating quality factors in raw or processed food products that are frozen or refrigerated. Both physical and chemical methods are needed, the committee noted.

Established under the Research and Marketing Act of 1946, the committee is composed of authorities on frozen and refrigerated foods. Its detailed recommendations for research to be undertaken by USDA will be submitted formally to the Department within the next few weeks. Copies of this report will be available from the committee's executive secretary, Marshall J. Goss, Office of the Administrator, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.

Len B. Wooten, manager of Ninth Street Skookum Growers, Inc., Wenatchee, Wash., was elected chairman of the group, and H. C. Diehl, director of the Refrigeration Research Foundation, Colorado Springs, Colo., was reelected vice-chairman.

Other Research Proposals

Other research proposals that the committee felt deserve high-priority attention include:

1. Strengthened studies on the time-temperature tolerance of frozen vegetables, fruit, cereals, eggs, poultry, meat and dairy products, and precooked frozen foods.

2. Expanded work on packaging of frozen and other processed fruits, vegetables, vegetable and fruit juices, meats, and bakery products.

3. New research on the chemical and microbiological factors involved in the technology of frozen meats and meat products. Development of new frozen meat products, the committee noted, is dependent on such research.

Increased Research

4. Increased research to establish performance standards for trailer trucks transporting frozen foods.

5. Development of new meat products to give consumers items of uniform composition and provide a way to use meats in overabundant supply.

6. New research to survey temperature conditions which occur during the distribution of frozen foods from the processor to the consumer's table.

Members of the committee attending the meetings, in addition to Mr. Wooton and Mr. Diehl, were: Allyn C. Beardsell of New York, president of Container Laboratories, Inc.; Prof. L. J. Bratzler of the Michigan State University Department of Animal Husbandry, East Lansing, Mich.; Paul B. Christensen, manager of the North East Cold Storage Corp., Portland, Maine; William F. Giacomazzi, Jr., general manager of the Modern Ice & Cold Storage Co., San Jose, Calif.; Alvin Langfield, president of the Langfield Company, Inc., Oakland, Calif.; Dr. Wallace Roy, vice-president in charge of technical service, Minute Maid Corp., Orlando, Fla. and C. L. Snavely, president of Consumers Packing Co., Lancaster, Pa.

Mr. Christensen, the outgoing committee chairman, presided.

Low Temperature Humidity Recorder, Milk Freezing, Operations Research, Features of TRRF Bulletin

OCTOBER issue of The Refrigeration Research Foundation Information Bulletin included the customary announcements of the Foundation and a page on recent research and technical publications. The balance of the bulletin, some five pages, dealt with industrial notes.

The second item of the page on research reported on two hygrometer developments for the measurement of atmospheric humidity at a freezing temperatures. It noted that in addition to the Foundations project at C. W. Thornthwaite Associates' Laboratory of Climatology at New Jersey, the U. S. Air Force has developed a practical and useful instrument which has been tested under arctic conditions at Point Barrow, Alaska.

Under "Industry Notes" the Foundation bulletin reports on a Canadian project whereby thousands of quarts of milk are frozen in wax paper containers and shipped to remote bases. Reportedly, this project has been satisfactory as a fresh milk supply. The milk is frozen at minus 45 F, shipped in refrigerated cars, and capable of being held from 7 to 10 days after thawing.

The same report points out that a dairy in Saginaw, Michigan, has been freezing milk similarly. Production has been in the vicinity of 18,000 qts per month with deliveries of 40 to 120 quarts per customer. The company has been supplying this service for over a year at savings up to a nickel a quart to their customers. The customer defrosts the milk overnight before using it. The product separates slightly but shaking restores the milk to original appearance and texture.

"Operations Research" techniques for the refrigerated warehouse industry, suggested at the annual meeting of TRRF-NARW at Atlantic City, was one of the top subjects considered at the joint meeting of the TRRF-NARW executive committees in Chicago in September. The TRRF Bulletin announces the appointment of an Operations Research Committee composed of Philip G. Kuehn, chairman, Garth A. Shoemaker and Earle E. Hesse. The committee is to develop a comprehensive and suitable program for the next annual meeting of NARW to be held in Dallas, Texas, March, 1958. The committee met with the Director of TRRF in Washington, D. C. on November 9, to get the plans under way.

Other topics covered in the Research Bulletin were the educational efforts of an all industry test on handling frozen foods; T-T-T research; frozen foods, how badly they are mishandled; the greening of potatoes; storage of dry batteries; storage of rose nursery stock and tulip bulbs; fish freezing for bait and for animal or fish feed; the outlook of frozen meats, fish and poultry; and maximum permissible dose of radiation.

The Bulletin concludes with the heading "Equipment Ideas in the News" and lists a number of references on materials packaging and handling. Concluding item in the bulletin deals with the mold inhibitor for use in paints and white wash which had recently been tested favorably by the TRRF under warehousing conditions.

EXCLUSIVELY

Southwestern Ice Manufacturers 67th Annual Meeting

THE Southwestern Ice Manufacturers' Association annual convention was held in Austin, Texas, December 1, 2, and 3, at the Stephen F. Austin Hotel. The business sessions, including the addresses and the panel discussions were all timely and informative. A cross-section of today's ice market was presented through the reports and talks made by Paul Liebmann of Oklahoma City; William T. Jobe of the National Association; Harry Park of Stephenville; E. R. Bryan of Odessa, and Orval O. Roth of Harlingen.

Panel Discussions

The panel discussions were freely participated in from the floor, the only difficulty being that time was not sufficient for full development of all of the questions and topics that were brought to the floor.

The non-industry speakers, all from Austin, and their addresses brought to the convention information and inspiration that gave to the convention program balance as between the industry problems and the current civic, political and governmental life of today. These speakers were Reverend Marvin S. Vance, Pastor of the First Methodist Church in Austin; Honorable Will Wilson, Attorney General of Texas; H. C. Pittman, Jr., Chairman of the Texas Industrial Accident Boards; and Honorable Zollie C. Steakley, Texas Secretary of State.

The annual report of President T. D. Meacham reviewed the activities of the Association during the year 1957. Included in these activities were the Spring Ice Sales Meeting in April, and the Engineers' Conference in October, which were both well attended. The individual services of the Association were reported by President Meacham as including assistance and advice in difficult wage and hour matters, insurance, and numerous other problems that confront the individual member.

The President's annual cocktail party, dinner and dance were up to Southwestern standards for this annual social occasion for the Texas ice man and his lady. During the dinner, the traditional Certificate of Appreciation was presented to President T. D. Meacham.

Weatherreds Honored

A beautiful affair of the convention was a luncheon given by Mrs. T. D. Meacham for the ladies of the convention. The motif and spirit for this luncheon was in honor of the 50th Wedding Anniversary recently celebrated by General and Mrs. Weatherred. The decorations and colors were of gold, and the centerpiece was a large "50" rising from a bed of golden flowers.

The following officers and directors were elected.

Officers and Directors

President, Ben I. Cole, Southern Ice Company, Dallas, Texas.

First Vice-President, J. B. Hayes, Jr., Southwest Ice Company, Marshall, Texas.

Second Vice-President, Obert K. Irvine, The Southland Corporation, Dallas, Texas.

Treasurer, Ewing A. Capers, Southern Ice Company, Dallas, Texas.

Directors (one year): Shannon P. Cox, Jr., Abilene, Texas; Dan H. Johnson, Port Arthur, Texas; C. P. Metcalf, Austin, Texas; R. A. O'Neill, Corpus Christi, Texas, S. M. Udden, Corpus Christi, Texas.

Directors (two years): H. L. Harris, Angleton, Texas; H. N. Hopkins, Silsbee, Texas; O. H. McCollum, Hearne, Texas; J. C. Rountree, Pampa, Texas, and J. E. Proctor, Cisco, Texas.

Ice Processing Film

LAST winter the Ohio Association and the City Products Corporation of Cincinnati made an 18-minute 16-mm silent film of the City Products operation in Cincinnati. This film was shown at the tri-state meeting in Detroit in February. This film deals with redesigning the processing layout and the handling of ice into vending stations. A ten-minute script is available for use as an introduction when screening the film.

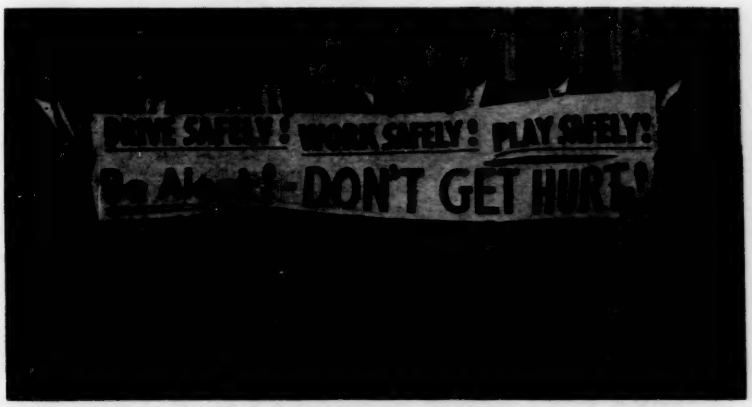
The Ohio Association is now making the film available for use outside the state for a nominal rental. Anyone or any group interested in using the film, should contact Miss Elizabeth Shannon, Secretary-Treasurer, Ohio Association of Ice Industries, P. O. Box 1725, Steubenville, Ohio.

Ohio-Indiana-Michigan Joint Convention

THE Ohio-Indiana-Michigan joint convention will be held this year March 2, 3, and 4, 1958. The Indiana Association will be the host at the Marott Hotel in Indianapolis, Indiana. The National Association will conduct the Great Lakes Regional Conference in connection with the Convention.

Safety Promoted at Southwestern Ice Convention

A SAFETY exhibit and talk presented by W. F. Leonard Jr. attracted much interest at the Southwestern ice convention held in Austin, Tex. December 1-3. In his talk Mr. Leonard discussed the problem of preventing injuries and accidents in the ice plant. The subject of safety also was discussed in the convention program by H. C. Pittman, Jr., Austin, Tex., and Orval O. Roth, Harlingen, Tex.

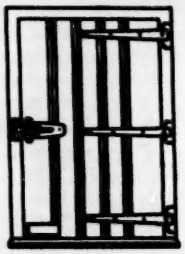


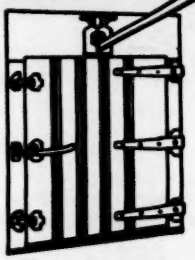
Ice men take a look at safety poster. In the picture left to right: E. D. Elliott, Jr., Progress Refrigerator Co., Louisville, Ky., Ben I. Cole, vice-president, Southern Ice Co., Dallas, Texas, F. D. Alderdice, Secy., Southland Corp., Dallas, Texas, Jim Fox, Central Engineering & Supply Co., Dallas, Texas, T. R. Collett, Jr., Division Manager-Southland Corp., Ewing Capers, Secy. & Treas., Southern Ice Co., Dallas, Texas, Earl Hays, Chemical Water Treating Engineers, Dallas, Texas, W. F. Leonard, Jr.

"Butcher Boy"

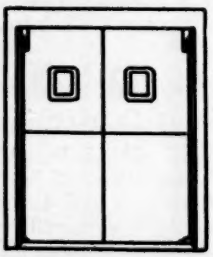
Since 1885

EXCLUSIVELY ENGINEERED



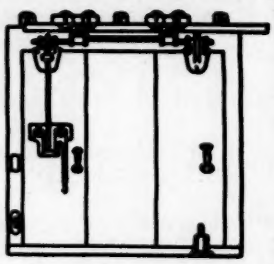


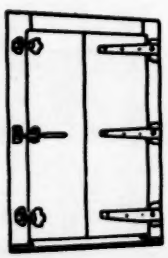
STANDARD COOLER-FREEZER DOORS

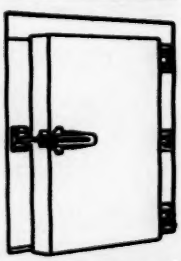


STANDARD VESTIBULE AND AUTO-CLOSE DOORS

HORIZONTAL SLIDING DOORS (Manual)

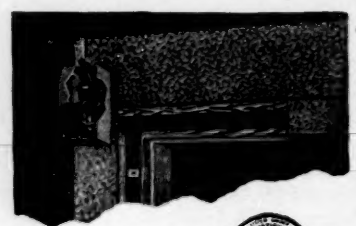






LOW TEMPERATURE INFITTING and OVERLAP

AUTOMATIC ELECTRIC DEFROSTERS WITH THERMOSTAT CONTROL



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FLEXIBLE RUBBER BATTEN DOORS

INCLUDING STANDARD DOOR FRAME

at no extra cost!

TYPE "TSH" WITH SEMI-HEIGHT MOUNTINGS

Especially adaptable for smaller door openings.

THEY PERMIT

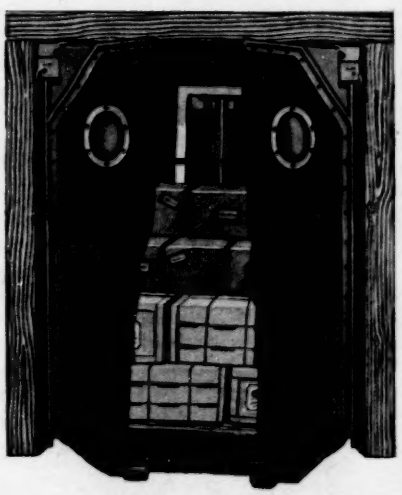
1. Safe passage of hand or power operated equipment with wider pallet loads.
2. Corner cutting with hand and power trucks.
3. Repeated abuse from impact of trucks at minimum damage and maintenance costs.

Model TSH battens are made of ½" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures.

Model TSH battens are furnished with No. 12 gauge galvanized steel jamb guards applied 4' 0" high with *no protrusions into the clear door opening.*

TYPE "FH" WITH FULL HEIGHT MOUNTINGS

Designed for wider and "straight traffic" doorways.



ADVANTAGES

1. Loss of refrigeration is held to a minimum.
2. Extra rigidity — tighter doorways.
3. Eliminates exposure and drafts near loading docks or at other openings.
4. Flexibility of battens permits repeated abuse and shock of mobile equipment contacts.
5. Permits movement of trucks and pallets at high speed in and out of refrigerated or other storage areas.

Model FH battens are made of ¼" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures, and will not tear under most severe conditions.

BUTCHER BOY REFRIGERATO

1000 BUTCHER BOY DRIVE

REFRIGERATOR DOORS

Electro SAFETY-SLIDE HORIZONTAL DOORS

FEATURING STRUCTURAL SIMPLICITY

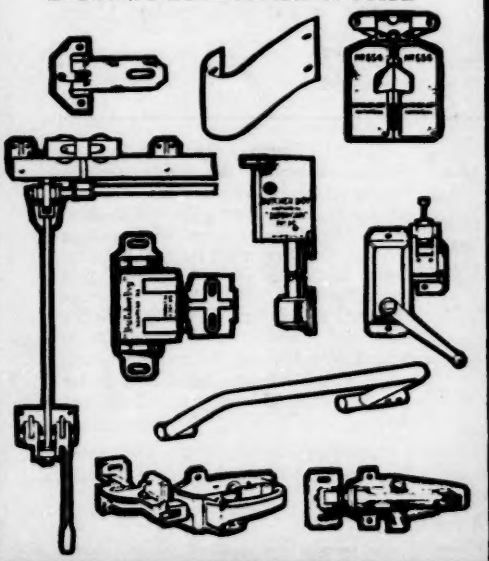
- **MECHANICALLY SOUND**
- **COMBINED "SPEED AND SAFETY"**
- **EXCLUSIVE AUTOMATIC SEALING "Gasket Assembly"**
- **SIMPLIFIED INSTALLATION**

Bi-Parting Horizontal Sliding Doors Available. CAUTION: Not recommended for use in cooler or freezer areas. Bi-Parting double horizontal sliding doors, of necessity, require gasket seals where the doors meet at the center of the opening. Hence, gaskets must be applied at "vulnerable" areas, exposed to contact by trucks or other objects which will rip or tear the gaskets, thereby destroying the necessary seal between the doors. *Field experience dictates this precaution against the use of bi-parting sliding doors.*

14 OUTSTANDING FEATURES

1 Overhead chain drive.
2 COMPACT—Electric Power Operator Assembly.
3 Heavy malleable iron Hanger Brackets.
4 Hyatt roller bearing Door Bracket.
5 Manual "Safety Release".
6 Automatic Sealing Assembly.
7 Automatic Electric Defrosters.
8 Concealed electric systems.
9 Safety Edge.
10 Complete Frame metal clad.
11 Special "SEAL" and "SILL" gaskets.
12 Defroster Drain Outlet.
13 Manual "Interior Safety Release".
14 "Roller-Type" Floor Wedges.

DURABLE HARDWARE



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Practical Refrigeration Engineer

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433 N. Waller Ave., Chicago 44, Ill.

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Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

From the President's Desk

ENTERPRISES, associations, corporations and all forms of activities are generally judged by their executives or leading personnel. NAPRE is no exception. At least that was the point brought home to NAPRE's Board of Directors at the 48th Annual Meeting held in November '57.

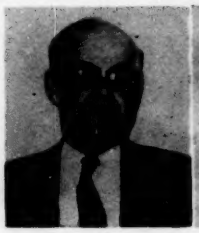
Old and new industrial members emphasized the fact that practical engineers were a big asset to the industry, but the engineers did not seem to realize it. Or, if they did, they didn't sell others on the merits of their own work. As honorary member Jay R. Watson pointed out in his brief address or response at the opening of the 48th Meeting, NAPRE should drop this modesty and let the refrigeration industry know the very fine job it is doing.

Taking a cue from the suggestions, this column for the first few months of 1958 will be devoted to biographical sketches of the NAPRE officers. Industry can thereby recognize the up and coming leaders in the association and the responsible positions they hold in their own fields.

First Vice-President

Roy T. Burns is the 1st vice-president of NAPRE, in which position he is not only successor to the chief executive of the association but responsible for the welfare of NAPRE's 40 chapters. Burns is a past president of Detroit Chapter, serving two consecutive terms for that subordinate group in 1953 and 1954. He has been a national director of NAPRE since 1952 and has previously served as second vice president.

Burns is Sr. Assistant Mechanical Engineer, Department of Buildings and Safety Engineering, for the City of Detroit. He has held that position for the past 8 years. He was previously refrigeration inspector for the same department and has been an employee of the City of Detroit for 22 years. In addition to his NAPRE activities, he is active in ASRE, being the past chairman of the Detroit Section.



Roy T. Burns

John Mariakis

Junior Veep

Elected 2nd vice-president of NAPRE in November, John N. Mariakis is concluding his term as president of Louisiana Chapter No. 2, at New Orleans. Mariakis has been a director of NAPRE since 1954 and has served on the national publications committee almost continuously since 1953.

The junior vice-president of NAPRE is responsible for the welfare of the members-at-large. He is chief engineer and building superintendent of Claiborne Towers (Sheraton Hotels) since that edifice was opened for operation six years ago. At 29 years of age, Mariakis is the youngest NAPRE director and perhaps youngest of engineers responsible for some of the south's largest refrigerating plants.

Frank L. Chase

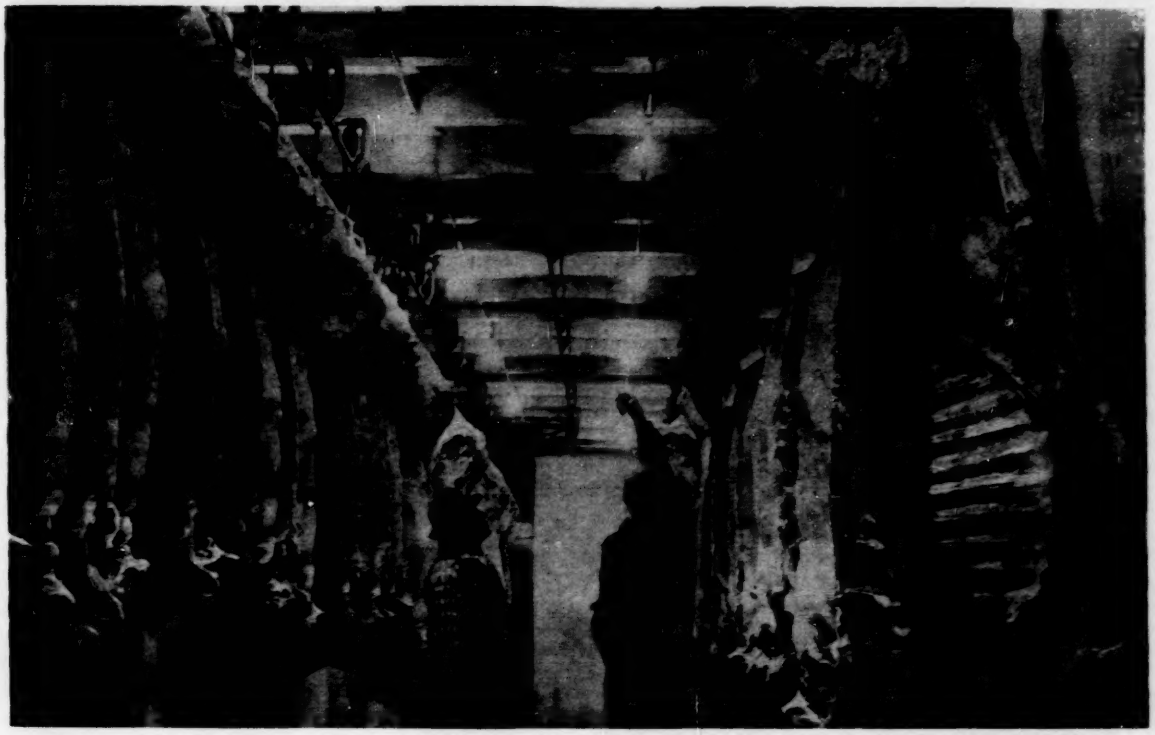
Frank L. Chase

EDITOR'S NOTE: NAPRE's president, Frank L. Chase, found the publisher using his own arguments against him, that of dropping his modesty and allowing this page to carry his own biographical sketch. Here it is, courtesy of IR editorial department:

Frank L. Chase is superintendent and chief engineer of the Hibernia Bank Building, the tallest in New Orleans, for more than 19 years. He is a member of the New Orleans Board of Examiners of Operating Engineers for the past nine years. He served as chairman of that board for three years. He is a member of Board of Advisors for the Apprentice Engineers Course at Delgado Trade School, New Orleans, the past two years.

Mr. Chase served Louisiana Chapter No. 2 (New Orleans) as educational chairman (1951-1952), vice-president (1953) and president (1954). He is serving his 6th year as a national director (1952-1958); was 2nd vice-president (1955-1956), and 1st vice-president (1956-1957), preceding his election as president for the (1957-1958) term.

Have Brine Spray Coils Seen Better Days?



This West Coast beef plant uses dry finned coil evaporative surface for carcass chilling as well as holding. Authors D. D. Wile and H. A. Halls described observations and tests in six such establishments, to NAPRE convention attendants at Chicago in November '57. They related how —

Proper Refrigeration Increases Meat Profits

D. D. WILE AND H. A. HALLS*

THERE are few who are not impressed by the thirty billion pound per year production of the meat industry. People within the refrigerating and meat industries themselves will be even more impressed by the figure of 450 million lbs. which represents the estimated shrinkage loss, due to refrigeration, during the short period that the product is in the carcass chiller and sales cooler. If an arbitrary average cost for all meats of 25 cents per lb is used, this shrinkage represents an annual loss of over 100 million dollars.

An executive of a large meat packer confided that their total shrinkage loss represents more than their profit. This therefore appeared to be an outstanding challenge to be faced up to by the refrigerating industry, and it has prompted a number of manufacturers to investigate.

Recold Corp's investigation has been confined to carcass coolers for beef. Carcass cooling represents a difficult refrigeration application and since beef carcasses have much greater bulk than other commercial animals they present the most difficult refrigeration problem in the meat-packing process.

Impressive Figures

Shrinkage loss, expressed in dollars, for a moderate-size packer having a daily beef kill of say 200 carcasses, or approximately 100,000 lbs is nearly 175,000 dollars. Hot carcass cooler shrinkage together with the sales cooler loss appears to run between one and one-half and two percent. A two percent shrinkage represents an annual loss of 500,000 lbs; or for beef at thirty-five cents per lb, 175,000 dollars for this one plant.

There is evidence that most of this loss occurs in the hot carcass cooler. The difference between a proper refrigeration system and an ordinary system can easily represent a reduction in shrinkage of from one-quarter to one-half percent. This amounts to savings of from 20,000 to 40,000 dollars per year for this one moderate-size packer. This saving, in some instances, can be realized over and over again by rather inexpensive improvements in the refrigeration system. In many instances a completely new refrigeration system can pay for itself in a few years' time through reduced shrinkage.

Factors Controlling Shrinkage

Cost, alone, is not a measure of proper refrigeration. Investigations have turned up refrigeration systems

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which were quite expensive and yet left much to be desired by way of rapid cooling and reduced shrinkage. This paper will discuss proper refrigeration in terms of the amount of *compressor capacity required*, the amount of *evaporator capacity required, method of control* and *type of air circulation*. All of these factors must be considered to obtain maximum quality with minimum shrinkage.

Capacity of an evaporator coil depends almost directly on the difference between air temperature entering the coil and the evaporating temperature of the refrigerant. This is commonly referred to as the "temperature difference" or TD. A large increase in cooling capacity can be obtained from the same cooling unit, by operating at a larger TD. The increased capacity however requires lower surface temperature. In the usual refrigerated storage room this causes lower humidity of the air and results in greater shrinkage. This relationship is well proven in the refrigerating industry and has resulted in the common practice of selecting evaporators for storing rooms at 10 F or less, TD.

Principle Difference 'Tween Carcass and Storage Coolers

Unlike ordinary refrigerated storage rooms, the hot carcass cooler presents two distinctly different cooling situations between the loading hours when heat is flowing rapidly from the hot carcass surfaces and later when the carcass surfaces are cold but the interior is still warm. For maximum product quality and minimum shrinkage it is necessary to study the requirements of these two operating conditions and provide equipment that will handle each of them to best advantage.

During the loading period cooler room air is in a nearly saturated condition due to the heat and moisture that rises from the shrouds and wet carcass surfaces. In a previous paper[1], the authors have shown that the surface temperature of the evaporator during this period has little effect on dehumidification. Thus it is practical to select cooling equipment on the basis of a wide temperature difference (TD) during the peak load condition, with proper controls to reduce this TD as load falls off.

Rapid cooling of the carcass is necessary to prevent bacterial growth and deterioration known as "sour bone". It is also true that rapid cooling minimizes shrinkage. Thus the ideal refrigeration system is one that will maintain low air temperature in the carcass cooler even during peak loading conditions. This ideal condition can be approached in practice only by providing ample evaporator and compressor capacity.

For the average beef carcass cooler, evaporator capacity of not less than one-half ton (at 10 F TD) should be provided for each ton of maximum daily kill. Compressor capacity should then be one ton of refrigeration per ton of daily kill at 15 F evaporating temperature. (This does not allow for pressure loss in the suction line from the evaporators to the compressors. So, the corresponding suction pressure, for compressor selection, should be decreased by the anticipated pressure loss).

With this combination of evaporator and compressor capacity the air temperature should hold below 35 F during average peak loading conditions. At this time the evaporators will be operating at approximately 15 F evaporating temperature and the TD will be less than 20 F.

Temperature and TD Control

With sufficient refrigeration capacity to hold low air temperatures during peak loading, it becomes necessary to provide suitable controls to prevent freezing at the end of the cooling period. A proper control system is of utmost importance if shrinkage is to be maintained at a minimum. There are two essential requirements for this control system:

1) It must operate from room air temperature, and

2) Control must be by a method that will increase the suction pressure on the evaporators as the load decreases. This can be accomplished by restricting the suction line or by reducing compressor capacity on the line.

Evaporating temperatures and air temperature in a typical cooler are plotted in Fig. 1 for four different types of control systems. The time scale runs for 24 hours starting at opening time in any one morning. Curves 1 and 1a representing evaporating and air temperatures, respectively, indicate ample evaporator and compressor capacity to hold the air temperature below 35 F even at peak load. Control is by means of a suction line throttling valve operated from air temperature.

Shortly after opening, as the introduction of warm carcasses increases the load, it will be noticed that air temperature rises slightly. This causes the suction line valve to open wide and throw the full system capacity on the evaporators in an effort to maintain the desired room air temperature. During this time the TD inereases to approximately 18 F. Shortly after the end of the loading period, air temperature begins to decrease and causes the control to start throttling the suction line.

Capacity Reduction By Decreased TD

Reduction of refrigeration capacity is thus accomplished by an increase of the evaporating temperature with a resulting decrease in the TD. The system should balance out with a TD of not over 8 F for several hours prior to opening the next morning. This ideal system provides the maximum cooling rate while the carcasses are warm, then balances out at a small TD for minimum shrinkage after the temperature of the carcass has been reduced.

Other Control Methods

Another method of control that is frequently used for carcass coolers, but which the authors do not recommend, is the constant pressure suction line regulating valve. The operation of such a system is shown by Curves 2 and 2a (Fig. 1). With this system the suction pressure is generally established at a point that will avoid too low an air temperature at the end of the cooling period. To insure against freezing of the flank portions of the carcass this temperature should not go below 30 F. With a constant suction pressure maintained throughout the cooling period, the air temperature must rise during peak loading as indicated by Curve 2a. Thus, cooling of the carcass is slower than with the controlled air temperatures as indicated by Curve 1a, even though the final air temperature is the same.

Compressors for the carcass cooler should obviously be of ample capacity to handle the peak load. Instances have been noted, however, where the compressors were selected on the basis of the average cooling load. With the compressor capacity sized for average load it will be undercapacity to handle the peak load. Suction pressure and air temperature will rise as shown by Curves 3 and 3a in Fig. 1. Finally towards the end of the cooling period the air temperature is pulled down to the desired point. This type of system is undesirable since it cools the carcasses at a slow rate and then finishes with a high TD which results in greater shrinkage.

Another system of control that

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[1] *Brine Spray or Dry Coil*, By D. D. Wile & H. A. Halls, Refrigerating Eng., Nov. 1956.

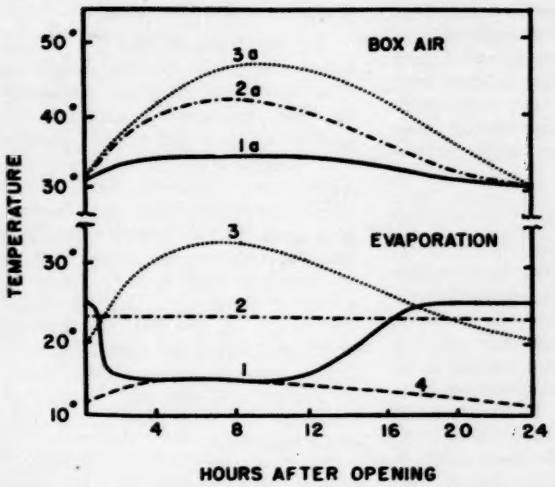


Fig. 1—Coil evaporating temperature and cooler air temperature vary considerably depending upon the type of control. Curves 1 and 1a are for control by a suction line valve that responds to room air temperature; Curves 2 and 2a represent control by a constant pressure valve in the suction line; Curves 3 and 3a indicate control by varying compressor capacity selected on average load without automatic control; Curve 4 represents control by a valve in the third refrigerant line operating from air temperature. This latter type control results in the same color air temperature as Curve 1a, but with lower humidity.

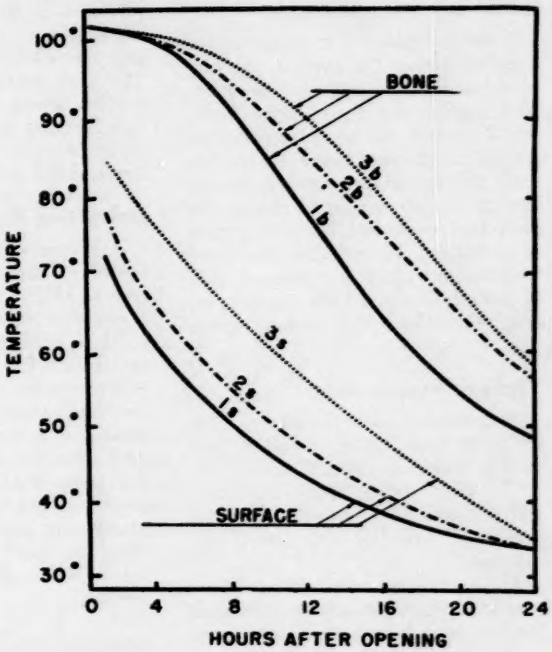


Fig. 2—Carcass surface temperatures and bone temperatures are shown for the various control systems of Fig. 1. Maximum cooling rate with minimum shrinkage is accomplished with the system indicated by Curve 1 in Fig. 1.

should be mentioned because of its undesirable performance, is the method of throttling the liquid feed to the evaporators by a control valve that responds to air temperature. Assuming that such a system has ample evaporator and compressor capacity it will follow evaporating temperatures as indicated by Curve 4 (Fig. 1). During peak load the liquid line restricting valve will be wide open and the system will balance at the same evaporating temperature as described for Curve 1; also the air temperatures will be held at a desirable low level as indicated by Curve 1a.

As the peak load falls off, however, the liquid line valve begins to restrict flow with the result that the evaporators operate partially starved and the evaporating temperature decreases. Finally towards the end of the cooling period the evaporators with only a portion of their surface active will be operating at a large TD. Thus, while air temperatures are satisfactory, the cooling period finishes off with a large TD which results in excessive shrinkage.

Unit Curtailment and Manual Control Undesirable

A somewhat similar and equally undesirable operating condition will be realized if control is accomplished duces the amount of effective evaporators in a cooler. This simply reduces the amount of eective evaporator surface and creates a high TD with corresponding low humidity and excessive shrinkage rate.

Manual control of the hot carcass is sometimes used in plants where operating engineers are on 24-hour duty. While automatic control is generally preferred, the results with manual control can be entirely satisfactory if it is done properly. The operator must watch the air temperature and manipulate the system to have full capacity during peak load. Then as load falls off he should prevent temperature going too low by decreasing compressor capacity or by throttling the suction line to raise the suction pressure at the evaporators. Throttling of the liquid line or cutting out evaporators must be avoided as it would increase the TD and increase shrinkage loss.

Reduction of Air Quantity

Some operators desire to reduce air quantity after the peak load has passed. The air quantity should be reduced only if there is sufficient evaporator capacity to operate at well below 10° TD with the reduced air quantity.

It is undesirable to reduce air quantity by stopping a portion of the fans in a cooler because this also inactivates a portion of the evaporator surface and causes the system to operate at higher TD than with all fans operating at reduced speed.

With low velocity air discharge and air returns located above the beams as occurs with ceiling-type blower units, it has been found unnecessary to reduce air quantity although no harm is done if there is adequate evaporator capacity.

Rate of Product Cooling

Numerous observations were made in the field on carcass surface and bone temperatures. Surface temperatures at various areas of the carcass were measured at the rump socket with a meat thermometer. While individual surface temperature measurements varied over a wide range they did represent a definite pattern and this is indicated in Fig. 2. Curve 1a and 1b indicate the carcass surface temperature and bone temperature respectively for the recommended control system corresponding with Curves 1 and 1a in Fig. 1. In a similar manner Curves 2s and 2b, 3s and 3b in Fig 2 correspond with their respective control system temperatures plotted in Fig. 1.

Initial Low Temperatures

It will be noted that while surface temperatures of the beef, at the end of the cooling period, may be somewhat similar for the various methods of control, the bone temperatures are quite different. Curve 1b emphasizes the importance of maintaining low air temperature even during the peak load condition. Bacteria growth is minimized by reducing the bone temperature rapidly and this can only be accomplished by low air temperature throughout the cooling operation.

Types of Evaporators

Evaporator surface affects the shrinkage rate. Types of surface frequently found in carcass coolers are:

(1) Bare pipe coils, operating with natural air circulation from an overhead bunker or with forced circulation.

(2) Bare pipe coils with continuous brine spray, located in overhead bunkers or in forced circulation units.

(3) Finned coils with continuous brine spray in a forced circulation unit.

(4) Brine spray without coils located in overhead bunkers or vertical chambers with the air motion induced by force of the spray.

(5) Finned coils with hot-gas or water defrost in either floor-type or ceiling-mounted units.

(6) Coils without external means of defrosting that are periodically cut off from the refrigeration system and defrost naturally due to the circulation of warm air through the coil.

Brine Hastens Shrinkage

In the past it has often been erroneously assumed that the presence of the brine increases the humidity of air and might thus reduce shrinkage. Exactly the opposite is true. Brine is hygroscopic, absorbs moisture from the air and thus increases the shrinkage rate. Reduction of humidity in air over a brine solution is well-known, yet its effect in a carcass cooler has been frequently overlooked. If a brine system and a "dry" coil system operate at the same surface temperature the humidity will be lower with the brine system and will cause increased shrinkage. This holds true for the straight brine spray system or the sprayed coil system. Brine systems also present a serious corrosion and maintenance problem.

Application of fins to evaporator tubing marked a significant advance in the refrigeration art. For a given space, weight, and cost it is possible to provide greater surface with the extended fin type coil than with bare pipe. Because of less surface, bare pipe installations operate at higher TD than similar installations with modern finned coils. The finned coils thus operate at higher surface temperatures and correspondingly reduced shrinkage rate.

Defrosting Methods

A proper defrosting system is essential for rapid cooling in a carcass cooler. While the "air-defrost" type of evaporators may be satisfactory for a 34 F holding room they are not satisfactory for the hot carcass cooler because the air temperature must rise well above 35 F, and remain there for a considerable period of time in order to effectively defrost the coils. Furthermore, during the peak load condition, the coils gather frost rapidly and then must be "taken off of the line" for defrosting at the time when maximum refrigeration is needed.

Fig. 3—Heavy rump section presents a more difficult cooling job than the lighter rib section of a carcass. In order to prevent bacterial growth, heat must be removed rapidly.

Water defrosting, controlled either manually or automatically, has proven highly effective and desirable for the carcass cooler. In this method water is flowed over the evaporator surface where it melts away the frost in a few minutes' time. In addition to causing only a very short interruption in the coil operation, water defrosting has the advantage of washing off the coil surface and flushing out the drain-pan each time that defrosting is accomplished. Accumulation of contamination and odors is thus avoided.

Pattern of Air Circulation

Air circulation in the hot carcass hit-or-miss basis. Gravity circulation from overhead bunkers frequently produces downward circulation in one part of a cooler and upward circulation through other parts. Similar patterns were observed with forced circulation systems that were improperly designed. In some coolers certain locations in the room tend to produce sour bone or slime due to inadequate circulation. Slime may also be caused if air that has become warm and humid by circulation over freshly loaded carcasses then comes in contact with the cold surfaces of carcasses that have been in the cooler for some time.

As sketched in Fig. 3, the rump section of beef is not only heavier than the rib section but presents a more difficult cooling job. Heat at the center of this section has a long way to travel to the surface. Since this thickest part of the carcass hangs nearest the rail, there is an advantage in reversing the natural circulation so that the *coldest air comes first in contact with the rump.* As illustrated in Fig. 4 this has been accomplished by circulating cold air at low velocity, from ceiling type evaporators, in the space above the beams so as to form a blanket of cold air over the entire room.

The cold air settles down between rails and recirculates up again as it receives heat from the carcasses. There is ample space between rows of carcasses for this type of local circulation and it occurs at a rapid rate while the carcasses are hot, thus providing more refrigeration for a longer period of time to the heavier rump section.

After the carcass surfaces have been cooled, the rise of warm air from the surfaces diminishes and a general downward circulation pattern develops as shown in Fig. 5. This corresponds to good practice in an ordinary storage room and provides uniform cooling throughout the final hours in the carcass cooler.

Fig. 6 shows an arrangement of water defrost type ceiling blower coils in process of installation. There are five of these coils mounted above the beams in each of two rooms designed for a total of 200,000 lbs of beef per day. Each coil has a refrigeration capacity of 5 tons of 10 F TD, or nearly double that capacity during peak load.

Fig. 7 is a view, looking up through the beams, of a portion of the water defrost evaporator units in an installation that has been in service for several years.

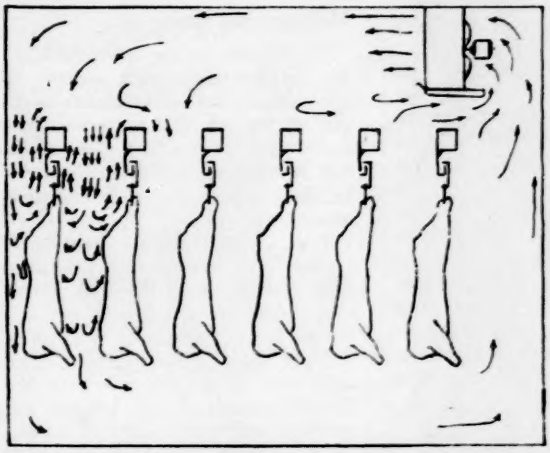


Fig. 4—Simple but satisfactory air circulation pattern is accomplished with both cold air discharge and air return above the beams, as accomplished with ceiling blower coils. This produces a blanket of cold air that applies refrigeration first to the heavy rump section.

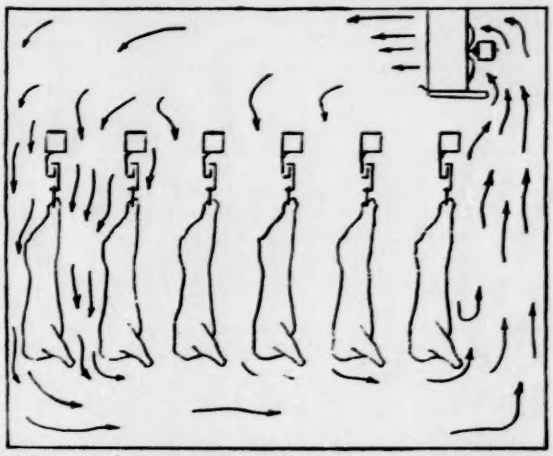


Fig. 5—After the loading hours when most of the heat has been removed from the outer surfaces of the carcasses, the air circulation changes into the usual pattern observed in storage rooms. Thus maintains uniform temperatures without excessive velocity.

Field Observations

Studies were made on some 12 West Coast beef packing plants in order to determine operating procedures and general results. In six of these plants measurements were taken of air and carcass temperatures throughout the cooling period along with other readings on the refrigeration system. Weights, for determining shrinkage, were obtained in five of these operations. Temperatures were measured at several locations over the surface of carcasses by the use of a contact thermocouple. Bone temperatures were taken by the usual skewer shaped thermometer.

These six jobs had the following types of refrigeration systems:

(1) Straight brine spray in overhead bunkers with gravity circulation.

(2) Brine sprayed coils in factory-assembled units located overhead, with forced circulation through distributing ducts.

(3) Floor type water defrost units located overhead with forced circulation through diffusers mounted on the units.

(4) Water defrost ceiling blower coils located overhead (two plants).

(5) Water defrost bunker coils with forced circulation.

Maximum air temperatures during loading varied from 36 to 44 F and at the time of opening were in the plants that were observed. Bone temperatures at the end of 21 hours in the chill room varied all the way from 51 to 58 F in carcasses averaging close to 550 lbs.

The extent of carcass shrinkage during cooling is difficult to measure accurately and even more difficult is the separation of the actual dessication of the product from the other items involved in shrinkage measurements. The routine practice is to weigh the carcasses just before entering the cooler as they pass over a section of the overhead track connected to a scale. The weight, at this time, includes the water in the shroud along with wash water that clings to the exposed meat surfaces and hangs in crevices. The weight of this added water is often included in shrink-

Fig. 6—Water defrost ceiling type blower coils in process of installation in a hot carcass cooler. Two identical coolers have a total capacity of 200,000 lbs. of beef per day.

Fig. 7—Looking up through the beams at a portion of the water defrost evaporators in a hot carcass cooler that has been in service for several years.

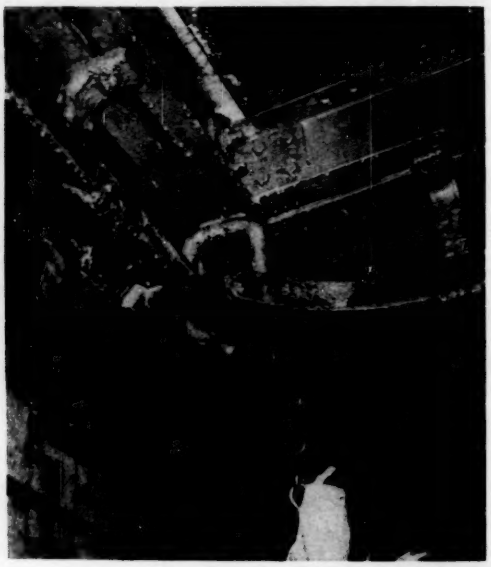
age figures and may represent as much as two percent of the carcass weight. Furthermore, there is some drip of body fluids and loss of suet particles.

Special Weigh Procedure

For this study, the carcasses were weighed just prior to washing, then were washed and shrouded in the usual manner. The next day, generally after about 20 hours in the cooler, they were again weighed, with shrouds removed, on the same scale. This procedure involved some disruption of routine production and could only be accomplished in those few plants that were willing to give wholehearted cooperation.

Weights taken on from one to six carcasses in each of the five jobs showed shrinkage from .54 percent to 1.2 percent for the 24 hours or less in the hot carcass room. The two lowest shrinkage figures, .54 and .60 percent, were recorded in the two installations with water defrost ceiling-type coils. The most significant characteristic of these two jobs was that in both of them the evaporators maintained a cold blanket of air in the space above the beams with a circulation pattern similar to that shown in Fig. 4.

Fig. 8—Comparative views of meat track equipment in wet and dry coil coolers.



Left—A typical view of overhead rail equipment in a carcass cooler refrigerated with brine spray. Deterioration of metal parts extends beyond the cooler to all parts of the building.

Right—View of a hot carcass cooler refrigerated with water defrost coils is noteworthy for the absence of rust and deterioration. This installation has been in operation for several years.

Maintenance Costs

In addition to the undesirable effect on humidity, brine systems increase operating overhead due to the cost of the salt that must be added daily. Greatly increased maintenance cost is also required throughout the building as a result of salt corrosiveness.

Cost of salt used in brine spray systems cannot be ignored. One plant with a daily kill of 480,000 pounds uses 3,000 pounds of salt per day for the hot carcass cooler at a cost of $21 per ton or $7,845 per year. This is a rate of $1,640 per year per 100,000 pounds of daily kill and was verified with only slight variations when checked on at several other plants. A true evaluation of this cost should include overhead items on the purchased brine making material and cost of handling labor.

Brine spray systems are also available with reconcentrators that eliminate or reduce the cost of adding salt. Equipment cost runs high. Operating costs are increased by the addition of heat to the brine or antifreeze, which must also be balanced with additional compressor capacity.

Deterioration of metal parts due to presence of salt in the air and the additional cost of maintenance due to this deterioration is a highly important factor. Fig. 8 shows a dramatic comparison between conditions commonly observed in "dry" coil and brine spray jobs. In the latter, to remain in operating condition, overhead rails must be wire-brushed and recoated with protective material at frequent intervals.

One plant has a schedule of reworking the rails on a 30-day schedule, while in others it may extend to a 3-month period. Most packers interviewed were unable to furnish even an approximation of maintenance costs on rails. One plant figures 40 hours of labor per week for each 400 ft of rail. Observations at this plant indicated inadequate maintenance as evidenced by excessive accumulation of rust on rails and switches.

Deterioration of rails and switches often hinders the movement of carcasses along the trackage and presents a definite worker hazard from falling trolley and hook assemblies. It should also be noted that the cleaning of a rail involves loss of cooler capacity. In some instances three tracks are kept empty to avoid damage to carcasses on rails adjacent to the one being cleaned.

In addition to the deterioration of overhead rails, corrosion from salt ex-

(Continued on page 52)

NAPRE

Question Box

H. P. Hayes

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

EDITOR'S NOTE: Answer to Question No. 1215 has been deferred pending receipt of additional data, both from SMR and the equipment manufacturer. In its place is substituted a more detailed explanation of the answer to No. 1214.

More on Question No. 1214

NH_3 Boil At Minus 28 F?

QUESTION NO. 1214 What is the temperature of liquid ammonia at sea level when held in an open container? Why is it at minus 42 F?—Q. M., NYC.

ANSWER: The temperature of liquid ammonia at sea level, when held in an open container is minus 28 F. If you are getting an accurate reading of liquid ammonia at minus 42 F, you must be taking the reading at a point where the pressure is only 10.4 psia.—H. P. Hayes.

ANSWER No. 2: The point to be considered is the term "open container". Actual conditions will vary with the shape of the open container. If it is a test tube or narrow mouth jar so the evaporating ammonia vapor pushes all the air out, the temperature will be the expected minus 28 F.

If the liquid is in a shallow pan or saucer so that some air reaches the surface of the liquid ammonia, it will cool to a temperature corresponding to the partial pressure of the ammonia in this air. If this is done in a breeze so the evaporating ammonia gas is carried away rapidly, its partial pressure in contact with the liquid will be low, and very low temperatures can be obtained. It is the same phenomenon that makes it possible to cool water below 212 by evaporation.

Ammonia is pretty smelly to experiment with. However, Refrigerant-12, which should boil at minus 21 F at atmospheric pressure, can be easily brought below minus 50 F in this way. The reader can easily verify this with some Refrigerant-12 and a thermometer with a low enough scale.—Guy R. King.

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ENGINEERING AND INSTALLATION SERVICE —

Are Back Pressure Controls Same For All Refrigerants?

QUESTION No. 1216: I have noticed that several manufacturers of refrigerating equipment do not make equipment for both ammonia and the "Freons". One of these items is the back pressure regulator. Are the characteristics and nomenclature the same in the valve for both refrigerants? Does the stem at the bottom of the valve work the same way for both refrigerants? Can you supply me with the makers of the EPR for Refrigerant-12?—A.E.C., Los Angeles.

ANSWER: Regardless of kind of refrigerant used, there are basically two types of back pressure regulators in use today: direct acting and pilot operated.

The direct acting is generally limited to the smaller sizes because the valve opening is limited to the distance which a metal bellows or a diaphragm can move without permanent set. Also, the direct-acting type usually requires at least *several pounds rise* above valve opening point to become wide open and the control point consequently varies with the tonnage passing through the regulator.

The pilot operated type uses a built-in or remote diaphragm-type direct-acting regulator to operate the main regulator, which is piston powered. Pilot operated types may be built in all sizes from ½ in. to 12 in. port or larger. Because only a tiny piloting stream of gas must pass through the pilot regulator, the control point of a pilot operated regulator usually varies by *less than one pound* from closed to maximum tonnage.

The smaller back pressure regulators of some manufacturers are not for use on ammonia because of brass construction. These smaller regulators are sometimes called "C.P. valves" or "constant pressure valves" as well as EPR's, "evaporator pressure regulators", or "back pressure regulators".

The single stem on the small direct acting regulators always controls the pressure setting, whether the stem be on the top or bottom. On pilot-operated regulators, the top stem adjusts pressure while the bottom stem is for manual opening.

The following companies make back pressure regulators for Refrigerant-12: small regulator—A-P Controls, Alco, Aminco, Detroit, Temprite; medium and large regulators—Alco, Hubbell, Neuert, and Refrigerating Specialties, Co.—C.C.H,III.

Insulation Inquiry

QUESTION No. 1217: What is Gilsonite? Is it the same as Gilsulate Could it be used for refrigeration insulation?—J.P.W., Chicago.

ANSWER: Gilsonite is an inert, stable hydrocarbon which occurs in nature. It looks like coal but does not burn. It resembles an asphalt, but it isn't one. It is found only in Eastern Utah and Western Colorado.

This mineral is being marketed under the name "Gilsulate" as a loose, poured granular insulation for underground piping with 220-520 F temperatures, installed by simply pouring and tamping. The heat from the pipe fuses the "Gilsulate" adjacent to the pipe into a semi-plastic core. The "Gilsulate" adjacent to the fused material is sintered, and the balance lies in loose granular form. Advertising literature refers to this as the "triple-zone" structure of protection.—H. P. Hayes.

When To Air Condition

QUESTION No. 1218: How do you know when a building needs to be air conditioned? Are there any specific temperatures and humidities which clearly indicate that air conditioning is needed? For example, would air conditioning be recommended for a clothing store which is at 85° F d.b. and 52% r.h. many days of the year?—R.G., St. Louis, Mo.

ANSWER: For buildings already in use, the opinions of the users are probably the best criteria to use in determining whether or not air conditioning is needed. Frequent complaints of discomfort by the occupants are a reliable indicator because, after all, the purpose of air conditioning is to create comfortable air conditions.

For buildings not yet constructed and for a general guide, charts are available which show temperature and humidity limits for the "comfort zone" for most people. If air conditions are predicted, or are measured and found to be outside these limits, air conditioning would be recommended. These charts may be found in most handbooks and textbooks in air conditioning.

Economic Considerations

The factor of economics always enters in because sometimes the value of comfort and clean air might not seem to be worth the price. In general, it is a question of how much a person is willing to pay for comfort.

In the case of the clothing store, I would consider not only the comfort of the customers and workers but also the protection of the merchandise. Properly conditioned air plays a great part in preserving goods by reducing soilage due to customer handling and dirt.

According to the comfort charts referred to above, about 50 percent of the occupants would be comfortable at 82 DB and 50 percent relative humidity. Since the conditions of 85 DB and 52 percent RH given in your example exceed the 50 percent comfort point, air conditioning should probably be installed. —H. P. Hayes.

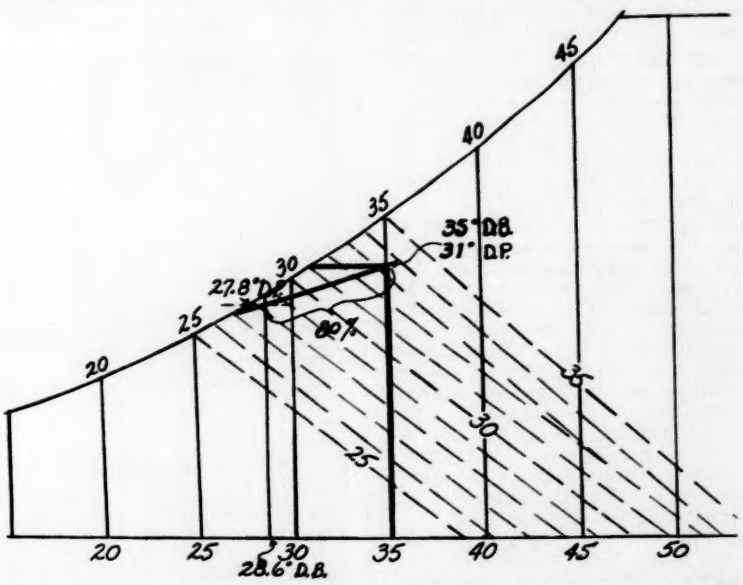
Stumped By Trade Jargon

QUESTION No. 1219: Would you explain what is meant by the term "Coil-by-pass factor"?—C.M., GDC, Fla.

ANSWER: Heat and water vapor transfer to the wet surface of a cooling coil can be completely described by its contact efficiency and its by-pass factor. On the wet surface is an adsorbed air film which is saturated with moisture and is substantially at the coil surface temperature.

Heat and water vapor transfer occur almost entirely by the mixing of the molecules of the air stream with the molecules of the adsorbed air film. Molecules which momentarily become a part of this film while passing through the coil are said to have contacted the surface, while molecules which do not become a part of this film are said to have by-passed the surface.

The percent of the molecules which momentarily become a part of adsorbed film is termed the contact efficiency and the percent of the molecules which by-pass the surface is termed the by-pass factor. The contact efficiency is 100 percent minus the by-pass factor.



Coil by-pass factor demonstrated on psychrometric chart—coil contact efficiency is 80 percent.

Consider the simultaneous removal of heat and water vapor by a coil having 80 percent contact efficiency with air entering at 35 F DB and 31 F DP temperatures, and with a wet coil surface temperature of 27 F. The heat and vapor transfer process can be represented on a psychrometric chart by a straight line drawn from 35 F DB, 31 DP to 27 F on the saturation curve. The air will be cooled 80 percent of the distance toward the saturation curve and will leave the coil at 28.6 F DB and 27.8 F DP.—N. S., San Luis Obispo.

Why The Difference In Psychrometric Charts?

QUESTION No. 1220: I have recently changed jobs from plant refrigeration to air conditioning installation. In studying psychrometric charts, I notice that many different companies print charts and they are slightly different from each other. Are the differences big enough to worry about? On an actual job would it make much difference which chart I used?—G.B., NYC.

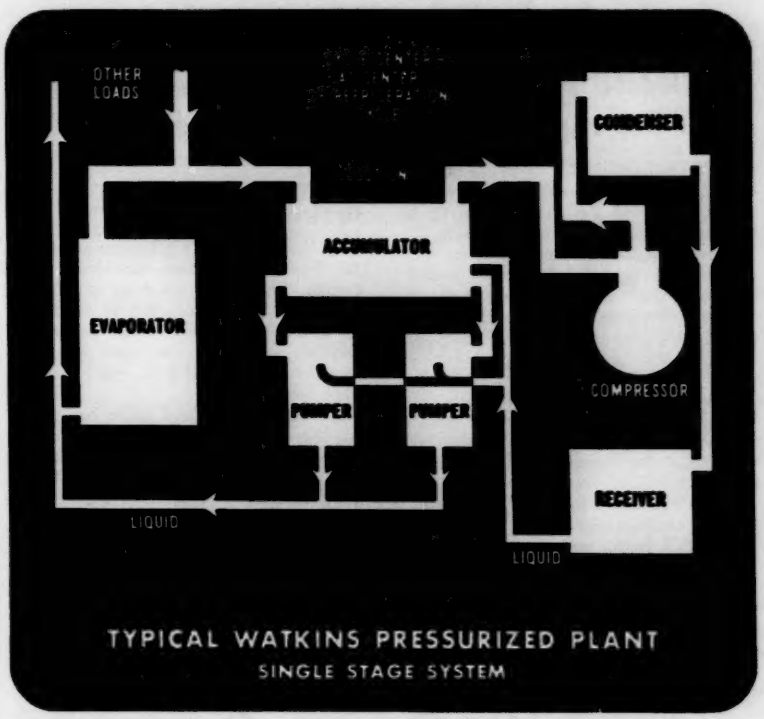
ANSWER: There is a difference in several of the psychrometric values on various charts. These errors come about by attempts to simplify the psychrometric charts.

The American Society of Heating and Air Conditioning Engineers has done more experimental work than any other organization in refining psychrometric data and has printed the most complete of all psychrometric charts for sea level application. Psychrometric data has also been carefully analyzed by the Committee on Psychrometry, American Society of Refrigerating Engineers. As might be expected, there is no substantial difference between values on the ASHAE and the ASRE charts.

Some companies have felt that these charts were a little hard to use and have made simplifications which do not lead to excessive error for most applications. Before discussing these simplifications a few of the psychrometric terms should be carefully reviewed:

Engineers do not deal with absolute heat content on the psychrometric chart, but with heat content above a certain level or datum. This datum is the heat content of liquid water at 32 F for the water vapor in the air, and 0 F for the dry gases of the air. Specific enthalpy is the heat content of one pound of dry air with its associated water vapor above this datum. Unfortunately, the enthalpy is not quite constant along the thermodynamic wet-bulb line.

This matter was first investigated by Willis H. Carrier in 1911 and published in his paper, "Rational Psychrometric Formulae". Along the thermodynamic wet-bulb line the *sigma* function rather than the enthalpy is constant. *Sigma* is the enthalpy of the air minus the heat that would be required to raise the liquid water that evaporates into the air, from 32 F to the wet-bulb temperature. The difference between the specific enthalpy and the *sigma* function is small.



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Centralized automatic refrigeration control unit offers large power savings

Large power savings. Condensing pressures are allowed to fall to lowest values obtainable from condensers, winter and summer. For example, an ammonia plant of conventional design, delivering 100 tons continuous refrigeration load, in the Chicago latitude, can save as much as $3850.00 annually on its compressor power bill. (Based on evaporative condensing, 25 PSIG suction pressure, 1½c kwh., 90% motor efficiency.)

Automatic protection. Provides suction trap protection for compressors.

Automatic "conditioned" feed. Feeds fully sub-cooled liquid at suction temperature and constant pressure, regardless of condensing pressures.

For any plant, any refrigerant. The unit is supplied for any sized plant, single-stage or two-stage systems, and for any refrigerant.

WATKINS REFRIGERATION SYSTEMS

Lower first cost. For a new plant, the specification of Cycle Center design permits the use of simplified control equipment, thus reducing first cost.

You will profit by reading Bulletin CC-1 which gives complete data on the Cycle Center. It contains a valuable power savings chart, gives system diagrams and presents additional advantages.

Manufacturers of: Recirculators, "Tell Tale" Solenoid Valves, "Coil-Flo" Hand Expansion Valves, Atmospheric Spray Evaporative Condensers, Purgers, Freezer Evaporators, Hot Gas Defrosting Systems.

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Confusion also occurs between relative humidity and percent saturation. Relative humidity is the ratio of the vapor pressure in the air to the vapor pressure which would be in the air if it were saturated at the dry-bulb temperature. Percent saturation is the ratio of the specific humidity in the air to the specific humidity that would be in the air if it were saturated at the dry-bulb temperature.

There can be no confusion on the ASHAE chart since on it are plotted thermodynamic wet-bulb lines, constant enthalpy lines, relative humidity lines and percent saturation lines. Likewise, there is little room for confusion on the ASRE chart. On this chart is plotted thermodynamic wet-bulb lines with values of enthalpy at the saturated condition and with correction curves for the enthalpy at the non-saturated conditions. Relative humidity lines are omitted.

Charts published by others plot either constant enthalpy lines or thermodynamic wet-bulb lines, and give specific enthalpy values only at the saturated condition. Likewise the engineer may find either relative humidity lines or percent saturation lines on these charts, but not both.

For accurate work ASHAE or ASRE charts are recommended. However, any of the other charts are suitable for most engineering work, provided the engineer obtains all of his values for a specific problem from the same chart.—Norman Sharpe, San Luis Obispo.

New Questions

High pH Detrimental To Skating Rink Grid?

QUESTION NO. 1221: I am seeking information on a calcium brine situation I am concerned with. About two years ago in the plant I operate, a leak in the evaporator occurred during an ice show. I had to continue to operate although ammonia was leaking into the brine system (12,000 gal.). After the show I boiled the brine and removed most of the ammonia, then added acid to reduce to proper pH (advised 8.5).

Since that time I have repaired two more tubes that started to fail. Although I got at them quicker, the pH climbed to 9.4. I boiled the brine and got the pH down to 9.

Now comes my problem. Should I add acid again to remove the ammonia that remains in the brine; dump it and start new (expensive); or am I in any danger of injuring piping in the ice rink floor, which is buried in concrete.

Our system is all iron construction with a shell and tube condenser, and evaporator; rink size 200 ft. by 85 ft.—E. McC, Butte, Montana.

Substitution of NH_3 Parts In Refrigerant 12 System

QUESTION NO. 1222: Our plant was converted to Refrigerant-12 several years ago. A York 5 hp 3x3 ammonia condensing unit that was taken out of service then, has not been used since that time. Can the entire system or any of the component parts such as the compressor, condenser, receiver, or evaporator (unit cooler) be converted and used with Refrigerant-12?—C. G., So. Ea. Penn.

Keeping Inhibitor Active In Mixed Brine Solution

QUESTION NO. 1223: Mine is an Arctic Pownall stationary can raw water system. There are two units of 20 and 30 tons capacity, installed in 1922 and 1923, respectively. The brine tank plates together with the cans have not been changed or removed from their position since then.

In September 1956 I made new brine for the larger unit, using local $CaCl_2$ The quantity was about 18 tons, and it was a dirty brown in color. About three months later a large leak developed in the rivets of the brine tank. This was repaired and the brine loss was made up by adding ½ ton NaCl, as $CaCl_2$ was not available. Another leakage again developed this August and it too was repaired. As before another ½ ton NaCl was added. So now I have a mixture of $CaCl_2$ and NaCl brine.

Incidently I find that by addition of NaCl there seems to be better performance. But the density of the brine does not stay for long and fails rapidly, although in a fixed can system there is no loss of brine, as the cans are fixed in position and only the blocks come out. But that is one thing I want to know, why?

Apart from this, the pH value was taken and found to be 5.6. This was in August. So I added 25 lbs. of caustic soda, and the pH was 6.67. Now as per data book I added 15 lbs. sodium dichromate per 1000 cu. ft. brine plus 20% caustic soda. The brine is about 1600 cu. ft. The dichromate added by me was 30 lbs. plus 20% caustic soda, slightly more than specified as I allowed for the NaCl content of the brine. On analysis about five weeks later the pH was 6.86 and the chromate content NIL. The chemist said that there was a lot of iron rust in the solution and it was possible that this caused the chromate to precipitate out of solution.

The problem is how to keep the dichromate in solution? Why should it settle down? Can you kindly explain this phenomena and show me what to do to rectify the position. The proprietors wish to know if it is good practice to add sodium dichromate plus 20% caustic soda as a method of brine corrosion control. How is it that some authorities give 15 lbs. and other 50 lbs. of dichromate required? Why so vast a difference? Which is a better figure for better performance and control? In my case of mixed brine what do you recommend? S.N.S., Bombay.

Radiant Comfort Cooling Without Ceiling Condensation

QUESTION NO. 1224: Radiant cooling ceiling panels are being used successfully in air conditioning jobs in San Francisco. What is the theory behind these panels? How do they prevent objectionable condensation?—J. S., Chicago.

Sputnik Enters Refrigeration Field

QUESTION NO. 1225: Maybe I don't understand the fundamentals of heat transfer. I always thought that the faster cool air blows past an object, the greater the cooling effect. Why, then, do the scientists say that satellites will burn up on re-entering the atmosphere. It must be at least minus 60 F at such high altitude. That should be cold enough to cool anything.—Thomas

Combustion Efficiency

QUESTION NO. 1226: Part of my responsibilities include boiler operation as well as refrigeration. Will you answer two questions for me?

1. What does boiler horsepower mean?

2. How can an Orsat analysis tell me whether or not my combustion is efficient?—Wm. C., Chicago.

Bulletin on Corrosion

ENGINEERS and others associated with the design and operation of refinery equipment will be interested in a reprint (Bulletin TR-548) of an article titled, "The Corrosion of Ferrous-Metal Tubing in Refinery Service." The article deals with separate phases of ferrous metal corrosion in the refinery field. Copies of this illustrated pamphlet, known as TR-548, are available without charge upon request to the division's general sales offices at Beaver Falls, Pa.

Paper Plant Converted To Cold Storage

THE Terminal Ice & Cold Storage Company, Salem, Ore., has purchased the Western Paper Converting Company plant at Front and "D" streets for approximately $150,000. Terminal Ice operates the largest cold storage plant in the state, across the street from the recently purchased plant. The new acquisition will be converted for cold storage use, it was reported.

Minneapolis Hotel to Be Air Conditioned

THE Normandy Hotel, Minneapolis, Minn., plans a million dollar expansion, to include all air conditioning. This would make it the first all conditioned hotel in the Twin Cities, according to John Noble Jr., president of the Noble Hotel Company which operates the Normandy.

News Notes and Chapter Activities

Canadian Members-At-Large Operate 400-Ton Freezer

COALDALE, ALBERTA, Can.—Broder Canning and Freezing Company is not perhaps the biggest freezing factory but it comes fairly close in size to the biggest. It has a 400-ton system, so writes Bill Gomany, NAPRE member-at-large. Gomany is one of the shift engineers in the Broder plant located at Lethbridge. Other members-at-large in this plant include John Gomany, his brother, and John Vosburgh, who is plant manager.

During the past season these members-at-large were kept very busy not only in operating the refrigeration plant but also operating the steam generating plant and maintaining both canning and freezing machinery. Like any canning or freezing plant, the work comes in seasons, and in season the hours are long. Readers will get an idea of the amount of work involved from the following description of the refrigerating equipment at the Broder plant.

In the packaging and freezing department, there are 15 plate freezers. Some are Ingles, Americo, and Multiplate. These freezers hold from 900 to 1500 packages. The plant freezes peas, corn, all kinds of green beans, asparagus, broccoli, squash, cauliflower and mixed vegetables.

Broder also does tunnel freezing. The tunnel is 75 ft. long and is equipped with two belts. These belts are 70 ft. long and 6 ft. wide. In nine minutes the vegetables will be carried the entire length of the tunnel. Freezing capacity in the tunnel is five tons an hour. Thirteen fans going at 60 mph are included. Four flooded system type of evaporating units are used to lower the air temperatures. They consist of three bare tube type and one finned coil type.

Broder's cold storage plant has a capacity of 400 tons. Two 30-ton evaporating units cool the room.

In the engine room, the engineers are concerned with several different types of compressors. Booster compressors include the Rotovane, Frick, Worthington, Fuller and Vilter. These range from 40 to 120-ton. The 120-ton unit is the Fuller rotary booster compressor. High pressure compressors are York, Baker and Frick, ranging from 6½ x 6½, to 10 x 10 in. One giant size oil separator is located on the downstream side of the compressors. Seven condensers, Baker and Frick, handle plant requirements that range from 40 to 120-ton capacity.

Gomany concluded his description to NAPRE's first vice-president, Roy T. Burns, by commenting on the official organ of the Association and other educational material circulated by the Association. He finds the publication interesting and educational.—JOHN N. MARIAKIS.

Denver Chapter Hosts Sporlan Speaker

DENVER—The first meeting of the 1957-1958 season of the Denver Chapter, NAPRE, presented a speaker from the Association's industrial membership list. He was Mr. Niedemeir of the Sporlan Valve Co. He augmented his lecture with a slide film presentation.

Although the talk dealt with most types of flow equipment, his principle topic was expansion valves. Top of his list of instructions was the discussion on how to select the right size valve which would insure enough refrigerant supply to the evaporator without causing a flood back, or starve the coil.

The main reason for an expansion valve functioning improperly, it was explained, was the fact that most of the time they are not properly chosen. Another item important to the proper performance of the valve, is the proper sizing of liquid and suction lines. Niedemeir also showed how the capillary bulb should be placed, and emphasized the importance of proper placing of this sensitive element, if the valve is expected to function properly.

The October meeting was given over mostly to business. At this meeting, it was decided that the chapter would return to its old practice of meeting twice monthly. Two meetings each month seemed to have more successful attendance than a single meeting. It was decided that one meeting in the month will be devoted to presentation of speakers on timely refrigerating topics or plant visits. The second meeting of the month will be given over to a refrigeration course, and instruction in accordance with an instructors manual presented by Guy R. King.—S. GERALD HOEKSTRA

California Chapter Presents Three Educational Courses

SACRAMENTO—California Chapter No. 3 at Sacramento has obtained cooperation of the Sacramento Junior College in connection with three courses on Refrigeration and Air Conditioning. A regular evening class was formed at the Junior College as a result of a petition by 21 NAPRE members for such adult education. Concentrated efforts by NAPRE member Professor Angus Woodruff makes it possible for members to obtain four hours instruction per week in the following topics:

First semester—*Basic Refrigeration* by Guy R. King.
Second semester—Instrumentation
Third semester—Air Conditioning.—CHAS. B. HATLER

A New Answer to Wall Finishing Problems

Swift's ADCOTE

Adhesive Finish

ADCOTE is a new type of wall finish developed by Swift & Company to solve finishing problems for a variety of types of walls.

While Adcote was originally developed for use on insulation in low temperature freezer and cooler rooms, tests have indicated it is also a superior finish for concrete, brick and dry wall construction. Contractors who have used it have been particularly pleased with the ten advantages Adcote provides:

1. GOOD COLOR STABILITY
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To Serve Your Industry Better

Mississippi Group Chartered by NAPRE, State Secretary Addresses Meeting

JACKSON—Chartering the Mississippi Chapter No. One, NAPRE, took place on Saturday, October 19 with the Honorable Heber Ladner, Secretary of the State of Mississippi, as the principle speaker. National President, Frank Chase, officiated at the chartering ceremonies which were held in the Heidelberg Hotel.

The chapter was impressed and pleased at the fine representation from two of its sister states; namely, Louisiana and Tennessee. The new chapter was honored by having in attendance, four Past National Presidents: Charles Conley and Alvis Clay from Tennessee Chapter No. One, Memphis; A. E. Wegener and Leo J. Vivien of Louisiana Chapter No. 2, New Orleans. In addition, other distinguished NAPRE visitors included Second Vice President, John N. Mariakis and a National Director, Cecil Sullivan. The regional Membership Chairman, Milton Mancuso, also was present.

Attending from Louisiana were Messrs. and Mesdames, Frank L. Chase, A. E. Wegener, John N. Mariakis, J. Vernaci, James Chaisson, D. Fisher, Leo J. Vivien, Milton Mancuso and daughter. Attending from Tennessee were Messrs. Charles Conley, Alvis Clay, C. Sullivan, Dexter M. Gibson, Douglas M. Platt, L. C. Waldrop, and Charlie G. Moore.

Liss First President

First president of the new Mississippi Chapter is August G. Liss who officiated as master of ceremonies for the charter presentation. Dinner preceded the installation ceremonies and the invocation was delivered by Rev. R. L. Case of the Utica, Mississippi Methodist Church.

Chairman Liss welcomed the members and guests and presented the Honorable Heber Ladner, Secretary of State. Mr. Ladner's theme was, "And Now, What of Tomorrow". His talk was very impressive and left the chapter feeling that they had heard an inspiring and educational talk by an orator and philosopher, and that the chapter had a powerful friend.

Other chapter officers installed by the visiting NAPRE officials were: G. F. Greiner, Vice President; J. R. Thompson, Secretary-Treasurer; D. G. Sanders, Sergeant-at-Arms; Charles E. Warwick, Educational Committee; Harold P. Armstrong, Coordinator of the Diversified Committee.

Represented at Chicago

Although the Mississippi Chapter was the newest, it made certain that it was represented at the 48th Annual Meeting held in Chicago. Fred Burdine was elected chapter delegate and autorized partial expenses. The chapter membership appreciated member Burdine's offer to represent them. Burdine made his report at the first December meeting of the chapter.

Vice President Greiner, has been devoting his time to representing the chapter on a committee which is drawing up a model code in air conditioning, heating and ventilating for this area. In all probability, the code will be adopted as a local city ordinance in Jackson and followed by other local communities.

Controls for Home and Industry was the title of a film shown by Raymond Bee, representative of Automatic Products Co., at the November meeting. Mr. Bee preceded the film presentation with a discussion of the different types of expansion valves used in the refrigeration industry; their manufacture, operation, and maintenance. Bulletins and catalogs on this equipment were presented to those in attendance.—J. R. THOMPSON

Certificate Course Started By Northern Florida Chapter

TAMPA—Refrigeration and air conditioning classes sponsored by the Tampa Chapter, NAPRE, apparently left a very favorable impression on the Tampa school system's adult education department. With the start of the 1957-1958 program, Mr. Carter of the Tampa school system announced that a room would be available in the Henderson School for the use of the local chapter. Therefore, a refrigeration course will be pursued again this year on a weekly basis, meeting from 7:30 to 9:30 on Thursday each week.

Local certificates will be issued on satisfactory completion of the course. Although Tampa Chapter appreciates the efforts of a National Education Committee and its work towards the issuance of certificates, it was felt that a local certificate will give added incentive to attendance at the meetings. It is hoped that by the time the national certificates will be issued, that Tampa will have proven its own course equal to requirements set up nationally, and that it will be merely a formality of issuing a national certificate to replace the local school certificate.

Two-part Course

The sessions will be divided into two parts. The first part will be Fundamentals, Compression System of Refrigeration, Refrigerants, Expansion Valves, Evaporators, Compressors, Condensers, Flow Equipment, Electric Controls and Controls Valves, Lubrication, Defrosting Methods, Compressor Drives, Food Preservation, Operation, Servicing, Refrigerated Enclosures, Instruments and Meters.

The second part will be Heat Calculations, Humidity in Refrigerations, Compressor Calculations, Refrigerant Lines-Pressure Drops, Brine in Refrigeration, Liquid Cooling, Complete Systems, Carbon Dioxide Systems—Dry Ice, Altitude and its Effects, Absorption Systems. The Refrigeration Code. Questions from the Floor, selected Topics and Problems.

The subject matter of the above training course is based on the text as prepared by Guy R. King, Refrigeration Instructor of the Santa Monica City College, in collaboration with the National Education Committee of NAPRE.—JOHN G. HOLZBERGER

Cooling Towers Featured At Kansas City Meeting

KANSAS—Home town talent was selected by the program chairman of the Greater Kansas City Chapter for the October meeting. Ed Rick representing the Marley Co. was introduced as the speaker of the evening. Rick has been in the cooling tower game some 24 years and demonstrated in his talk and in the Question and Answer period which followed, that he is well acquainted with all phases of design, engineering, installation and operation of many makes of cooling towers.

The speaker briefly gave the history and development of cooling towers down to the present day towers and describing the various types and kinds of towers in use. He pointed out the advantage and disadvantages of different types of towers and different materials used in construction of towers, and the operating conditions that are maintained in the various towers.

At the conclusion of his talk, general discussion was started from the floor

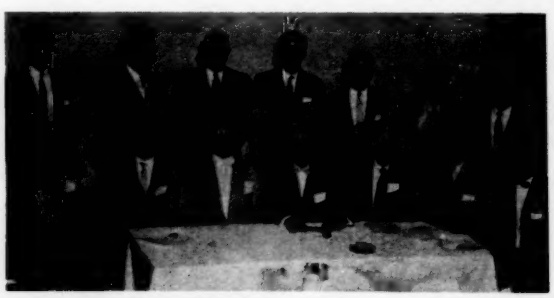

Fig. 1 — First Chapter officers of Mississippi No. 1, NAPRE (seated). Standing are the national officers who installed them. Chapter President A. G. Liss wields the gavel.

Fig. 2 — Members, guests and ladies who witnessed the Chartering of Mississippi Chapter. The Honorable Heber Labner, State Secretary, was the featured speaker.

which resulted in Mr. Rick giving the chapter the many reasons for selecting certain types of towers for certain jobs. He also gave, by example, methods of selecting the correct size of towers. He covered maintenance of cooling towers, and it was pointed out that in far too many industrial organizations, regular and complete maintenance is sadly neglected as far as cooling towers are concerned.—JOHN MULLER.

Illinois Members Take Up Post Convention Activities

CHICAGO—Twenty years between conventions is a long time. As a result, most Chicago Chapter members had had little experience in that sort of thing and playing host to the 48th Annual Meeting sort of detracted from and disrupted the chapter routine. However, with the last November meeting and the only meeting in December, the membership had the opportunity to get settled down in the old routine. The routine in Chicago is two meetings per month, each divided between refrigeration course instruction and a special speaker presentation.

At the December meeting, instructor Bob Ross covered Chapter 5 of *Basic Refrigeration*, Evaporators. Following Ross's leadership in the course material, Rogert Hart, Program Chairman, presented one of the chapter's own members as the featured speaker. He was Joseph Greenspan, Chief Engineer, Freezer Industries, Inc., and Frigidmeats, Inc.

Greenspan had been invited back to the chapter to give his convention paper. Most of the members had been otherwise occupied at the time that Greenspan presented a discussion at the 48th Meeting and had consequently missed his very fine work. This discussion covered the practical aspects of making a ammonia recirculating system operate. Other refinements such as balancing and locating sensing bulbs were also covered. It was understood that his paper will be reprinted in *Industrial Refrigeration* at an early date in 1958.

Defrost Protection

The featured speaker at the October meeting of Chicago Chapter was Howard DeBaugh, Chicago District Manager, Dole Refrigerating Co. DeBaugh discussed the Dole Heat-Cel for the benefit of NAPRE members present.

Howard DeBaugh

The Dole Heat-Cel is a re-evaporator designed to protect the compressor from liquid refrigerant slug back, during the hot gas defrost cycle. The Heat-Cel system consists of three parts; namely, The Heat-Cel—the Unit-Cooler—and Accessory Package. The latter contains hand valve, solenoid valve, and timer. Any of the three parts of the system are available without the other or as a complete package.

The main feature of the Heat-Cel is that it does not rely on the heat of compression of the condensing unit for heat. The Heat-Cel is heated by a calrod type heater and is thermostatically controlled to maintain a temperature of 120 F. Systems are available from ½ hp through 15 hp.—BILL O'REILLY

Refrigeration Oils Michigan Topic

DETROIT—George B. Bright B. Bright Chapter, NAPRE was honored with the presence of Dr. Edgar S. Ross of the Sun Oil Co. at the November meeting. A prominent lecturer, Dr. Ross made a special trip from Philadelphia to give the illustrated talk at the request of friends of his in the Bright Chapter. His presentation dealt principally with refrigerating oils, but he also answered questions on turbine oils and lubricating oils of all types. Members had prepared lists of questions in advance and it was surprising that a number of them included such questions on oil drilling topics and on asphalt paving. In turn, Dr. Ross surprised those in attendance by giving some very worth while and informative answers to such questions.

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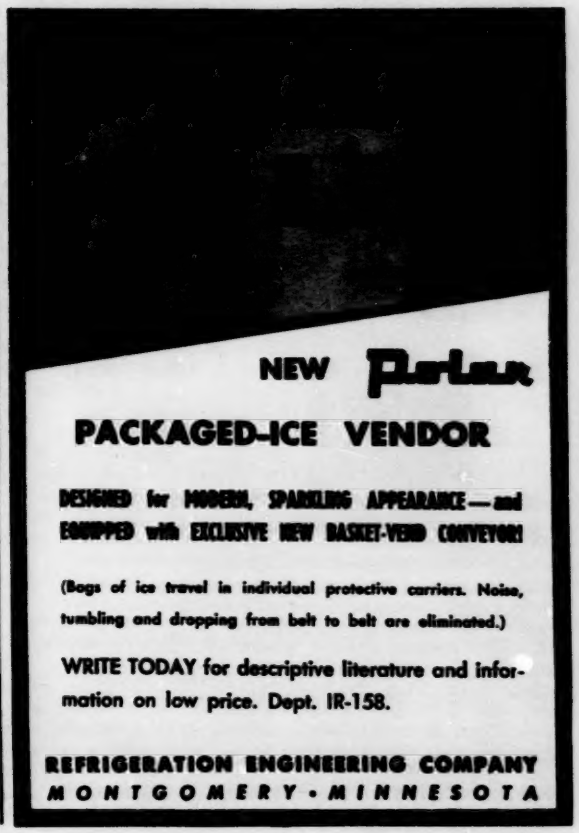

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DESIGNED for MODERN, SPARKLING APPEARANCE—and EQUIPPED with EXCLUSIVE NEW BASKET-VEND CONVEYOR!

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MONTGOMERY • MINNESOTA

Dr. Ross is a Chemical Engineer, Industrial Chemist and Master Mechanic. He is widely known as an authority on lubricants and lubrication, and has contributed much in the development of Refrigeration Oils. Serving as Chief of the Lubricants Section of the Petroleum Administration for War, Washington, D.C., he later resumed his former connection and is now Technical Representative, Industrial Products Division of the Sun Oil Co., Philadelphia. Members of the ASRE, RSES and RACCA in the Detroit area had been invited to this talk and a good number of them attended.--LEON ADAMS

Varied Speaker Program Follows Educational Sessions at Southern California

LOS ANGELES--Last quarter of 1957 was a varried speaker program presented by California Chapter No. 2 at Los Angeles. The first meeting of the quarter, October 2, featured two speakers and demonstrations on nuclear energy and the effect of radiation on the refrigeration industry. The second meeting of that month featured an insulation forum consisting of three speaker representatives of major manufacturers.

The first November meeting consisted of a field trip to the Lucerne Milk Company and Regal Ice Cream Company, divisions of Safeway Stores, Inc. Solar radiation's effect on window glass and the air conditioning of a modern office building was the topic of the principal speaker for the November 20 meeting. The only meeting held in December was held on Wednesday, December 4, at which time the chapter elected its officers for the coming year, and delegates to the 48th annual meeting of NAPRE made their reports.

Julius Heads Chapter Executives

Acting president since September, Michael Julius, engineer for California Consumers Corporation, was elected president of California Chapter No. 2, NAPRE. He had been elected vice-president for the previous term but had become acting president upon the resignation of Victor A. Stubblefield. Stubblefield had resigned to take a position in Bakersfield which had made it impossible for him to continue serving the chapter as president.

Michael Julius

Other officers elected in addition to Julius are: 1st Vice-president, Guy R. King, refrigeration instructor at Santa Monica City College; 2nd Vice-president, Lawrence H. Benedict, president, Benedict Co.; Secretary, Donald H. Byle, Union Ice Co.; Treasurer, Emmett T. Quinn, Pacific Fruit Express; Sgt.-at-Arms, Allen R. Slingsby, California Consumers Corp. Quinn and Byl were re-elected and King moved up from second to first vice-president.

Elected to Board of Directors were N. P. DeSantis, chairman, J. F. Granger, D. F. Green and R. E. Hitchcock; and to the Advisory Board, past presidents, Clifford P. Scott, Frank Eccleston and Frank G. Muzzy. President Julius appointed the following standing committee chairmen: Educational, Guy R. King; Entertainment, Ed. L. Nelson; Membership, George Paulick and Frank Eccleston; Attendance, D. H. Renfrew; Finance, Ralph M. Moore, and Employment, Michael Julius.

Nuclear Topic Popular

The program on nuclear energy and the effect of radiation on the refrigeration industry was given by George N. Paulick and Regis Gubser of California Consumers Corporation. To provide the audience with a fundamental grasp of the theory involved, they first presented a General Electric film from "A to Atom". By means of simple cartoons and simplified formulae the narration of the film explained the theory of nuclear fission and how irradiation can be applied.

Following the film, Paulick demonstrated and explained the operation and mechanics of radiation detectors (Geiger counters). The attention give to this phase of the program proved again that every man irrespective of age has hidden longings to be a gold or uranium prospector. Paulick made his demonstration more realistic by producing soil which had been affected by radium radiation. He presented a small cake of sand which had come from the site of the first A-bomb exposition at Almagordo, New Mexico. When the sand was brought close to the counter a characteristic "click-click" sound could be heard throughout the meeting hall. He gave a similar demonstration with a chunk of rock from Colorado which was said to have a uranium content.

To prove that certain amounts of radium or uranium have no deleterious effect on the human system, Paulick brought Ralph Moore of the California Consumers Corp. to the front and had him hold his radium-dial wrist watch against the counter. The instrument clicked merrily.

"Are you healthy, Ralph?" Paulick asked.

"To the best of my knowledge," Moore replied.

"You don't feel like your on death's bed, or something?"

"Nope."

"Well, that proves my point," Paulick stated. "There is a slight amount of radio-activity in most things around us. But unless it reaches a heavy saturation, there is no danger involved."

Gubser then took over and explained how irradiation is being applied to food products. He narrated the early experiments and pointed out that irradiation of food would probably take its place along side other methods of food preservation such as drying, salting, canning, refrigerated storage and freezing. It was pointed out that refrigeration before and after irradiation in some form or another, is a strong possibility.

Insulation Forum

The comparative merits of three types of cold storage room insulation--loose fibre, board form and cork pipe covering --were presented in their various aspects and applications by a three-man panel of experts who served on an Insulation Forum which highlighted the educational session on October 16.

L. H. Benedict, a member of the educational committee, arranged the program, served as moderator, and also presented one of the three short talks. The program was designed, Benedict said, to present to the membership the ". . . basic, important objectives in the design, construction and maintenance of cold storage facilities from the aspect of insulation for those who are vitally interested in obtaining maximum efficiency with the minimum expense from operating plants".

The other two panelists were Patrick Kidd of Fiberglas Engineering & Supply Company, and Lawrence Galt of Mundet Cork Corp., Los Angeles. Galt presented the story of board form insulation, replete with samples of the various types and shapes of insulation material that falls within this category. He offered first a brief review of the history and purpose of cooling space insulation. Basically, the job of insulating a cold storage room, he explained is a very difficult one because the engineer is trying to oppose the natural laws.

Benedict who appeared as the third speaker on the panel, discussed pipe insulation and emphasized again the overriding importance of obtaining a vapor barrier no matter what type of insulating material is used or what the application might be. A question and answer period was conducted at the close of each of the three talks.

Details of Field Trip to Follow

An early issue of INDUSTRIAL REFRIGERATION will carry details of equipment viewed by the NAPRE tourists at the combined Lucerne and Regal plants. Also, the report of the speaker's talk on solar effect, together with an illustration will be part of a subsequent report.--FRED HERR.

Colton Elects Officers

SAN BERNARDINO--New officers for the year 1958 were elected by members of California Chapter No. 5 on December 11. Officers elected were President, J. E. Finfrock, 1st Vice-President, A. L. Long, 2nd Vice-President, Roy Ashcom, Secretary-Treasurer, H. O. Bonter, Sgt.-at-Arms, Orando Bridgeman, Educational instructor, F. J. Scherer, Program chairman, C. H. Purkiss, Membership chair-

man, J. H. Mairs, and Directors, J. E. Machut, three years, A. W. Franklin, two years, and Carl L. Hooker, one year.

The third fall meeting of Colton chapter featured a preview talk by one of the National Convention Speakers, R. F. McKee of San Francisco, a question and answer session at the November meeting, and a convention report at the December gathering.

At the October 9 meeting McKee presented colored slides depicting the construction of Pacific Fruit Express Co.'s new plant at Ogden, Utah. These were the same slides which were incorporated in his talk presented later for the national meeting in Chicago. INDUSTRIAL REFRIGERATION will publish McKee's talk.

At the November question and answer forum one inquiry dominated. A member asked if a sulphur dioxide compressor could be converted for use in a Refrigerant-12 system. Consensus was to the effect that it would probably be cheaper to buy a new or used compressor than to go through all the effort and expense of converting or rebuilding the old one. Further, the discussion brought out numerous changes that would have to be made and precautions taken in the system itself if the old system were to be converted. It was pointed out that the Refrigeration Service Engineers Society and *Refrigeration Service Contracting* magazine had carried a number of excellent articles on this topic.

Delegates L. G. Schroeder made a very interesting talk at the December 11 meeting on the various sessions of the Chicago convention. He placed a great deal of emphasis on the field trips, especially the trip to the Argonne National Laboratories, the scene of the first 5,000 kw experimental boiling water reactor generator plant. Schroeder explained how the generating plant is used to supply part of the laboratory's needs. He also mentioned other applications of nuclear energy at that site, probably for research.

It is understood that the University of Chicago operates the Argonne National Laboratory as a contractor to the U. S. Atomic Energy Commission. At all three meetings educational instructor F. J. Scherer continued his discussion on compressors and different types of refrigerants.—H. O. BONTER.

New Cold Storage Plant

A NEW cold storage plant has been completed on Glendwood Street in Delano, Calif., for Martin J. Gutunich, a shipper of fruits to all markets in the United States. Built at a cost of $180,000, the plant's purpose is to stretch the marketing time for fresh fruit all through the Winter and into next Spring. The structure covers an area of 80 x 126 feet and is entirely insulated with redwood bark walls.

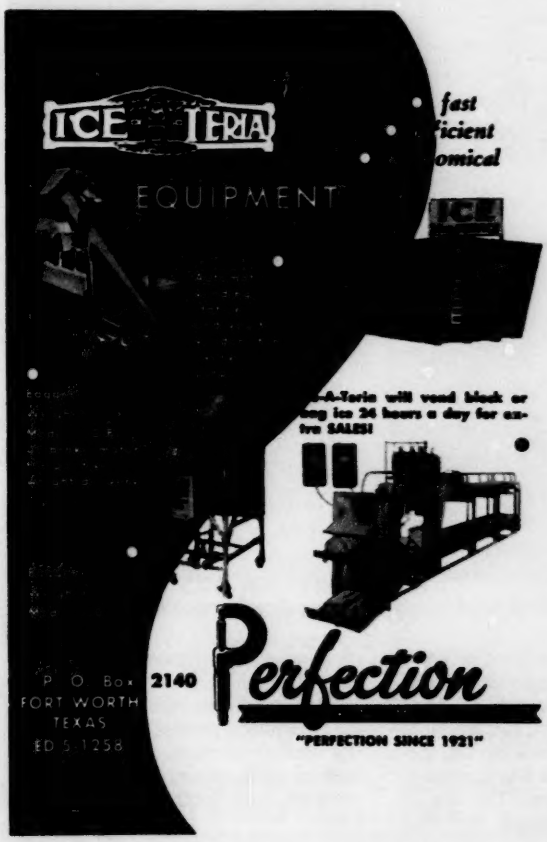
Big Food Warehouse Set For Puerto Rico

PUERTO Rico will soon have its first full-line wholesale food warehouse.

The enterprise will be headed by Associated Food Stores, Inc., a major New York grocery distributor, and American Food Enterprises, Ltd., subsidiary in Bayamon, suburb of the Puerto Rican capital of San Juan. The Commonwealth Government has leased to Associated Food a building, refrigerating facilities and a warehouse and has purchased $100,000 of preferred stock in the subsidiary.

The project will provide Puerto Rican food retailers and institutional establishments with a full line of quality groceries including meats, poultry, fresh fruits, vegetables, dairy products, eggs and frozen foods. Associated will cooperate with the Government in a program to improve retail efficiency with merchandising services, personnel training and promotional activities.

In addition, the company plans to provide marketing and distribution services, United States markets for Puerto Rican products such as fresh pineapples, plantains, coconuts, mangoes and avocados.



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AWA Annual Meeting Advance Registrations

ADVANCE registrations for the 67th Annual Meeting of the American Warehousemen's Association to be held next March 10-13 in Dallas are exceeding all previous years, according to AWA President R. M. King.

"Never before in the history of the Association," states Mr. King, "have AWA members responded in such record numbers to suggestions that they save themselves time and trouble by registering now. Each mail delivery brings more evidence of the enthusiasm growing in our industry for the outstanding program being planned for Dallas at the Adolphus Hotel. It must be true what they say about Texas!"

AWA headquarters reports that several unusual features are being lined up for the Opening General Luncheon which will honor First-timers of both AWA Divisions and the Opening General Session which will follow immediately.

Elmer "Sell the Sizzle" Wheeler, the "World's Greatest Salesman", will tell the luncheon about his "dangerous selling" techniques and Joseph F. Leopold, widely-known speaker and researcher is to address the Opening General Session on the extremely important subject of "Government and Warehousing".

New Cold Storage Warehuose

A NEW $100,000 corporation is being formed in Saginaw, Mich. to operate commercial cold storage facilities and leased warehouse space. The new company will be known as The Golden Triangle Cold Storage Company. Formation of the company was announced by Robert W. Grant, Jr., chairman of the board of The Grant Grocery Co. He disclosed the company has purchased the land and buildings but not the business, of Frankenmuth Frosted Foods Co. in the 2700 block on Perkins, Saginaw.

Frankenmuth Frosted Foods will continue its operation there in leased space, he said. Grant Grocery Co. also will be a tenant, moving about February 1 from 1900 North Michigan.

The FFF Building was constructed three years ago. It has 34,000 square feet of floor space and offers 14,000 square feet of below-zero storage. It occupies a 7½-acre site.

Poultry Industries Fact Finding Conference

TRENDS and forecasts in packaging, processing product development, sanitation, management, materials handling, quality control and engineering will occupy the attention of the Institute of American Poultry Industries when it gathers in Kansas City next February 14, 15 and 16 for its 29th annual Fact Finding Conference.

The over-all three day session at the Municipal Auditorium will be geared to the theme "for the tomorrow-minded", Institute president Dr. Cliff D. Carpenter has announced.

"The Fact Finding Conference offers tomorrow-minded business men in our $7 billion dollar food industry three important things", said Dr. Carpenter. "The fact-filled workshops are designed to point up new developments and offer practical ideas that can be taken home and put to work.

"The thousands of square feet of exhibits offer conference-goers the opportunity to inspect the latest and best in better equipment, products and services—those that are needed to do tomorrow's job today.

Five program sessions during the three day meeting will include: Outlook Workshop, Egg Workshop, Poultry Workshop, Management Work shop, and a Mandatory Inspection Workshop.

Last February, 3,333 poultry and egg processors, distributors, hatcherymen, producers, retailers, warehousemen and others attended the Conference—a record high.

Special Train for TRRF

MEMBERS of The Refrigeration Research Foundation will be pleased to hear of plans for a special train leaving Chicago for the AWA-NARW Convention City of Dallas on Thursday afternoon, March 6, arriving Friday afternoon in time for the next day's TRRF membership meeting and dinner. TRRF Scientific Advisory Council meets Thursday and Friday.

Venezuela Shirt Factory Installs Air Conditioning

Workmen install air conditioners in Venezuela shirt making factory.

A SHIRT making factory in Venezuela has installed 28 General Electric FCA-50 Packaged Air Conditioners. The new plant, Confecciones Jatu, S.A., was designed by Dr. Ernesto Fuenmayor Nava for the manufacture of Arrow Shirts. The use of packaged air conditioners provides multi-zone temperature control or uniform factory temperature even with wide variations in load because of the manufacturing process. Air Conditioning itself of all types, home and commercial, has enjoyed a remarkable resurgence in South American countries.

Refrigerated Trailer Rating Road Study

THE first two trailers to be rated in the TTMA-sponsored program to develop an industry standard method of measuring heat gain in refrigerated vehicles showed similar relations between the road performance and laboratory ratings, according to P. R. Achenbach, chief of the Air Conditioning and Refrigeration Section of the National Bureau of Standards.

A Steering Committee named to advise the NBS held its second meeting today in Washington, D. C. In reporting to the project's Steering Committee, Chairman Achenbach stated that if the heat transfer measured in the laboratory was taken as 100, the heat transfer measured operating at 50 mph on the Ohio Turnpike was between 120 and 130, based on a spot sampling of the road data. While the cooling loads of the two trailers were different, the ratio of laboratory rating and highway rating was remarkably consistent.

It was noted that one trailer showed a somewhat greater accumulation of moisture than the other and the one with the greatest weight increase due to moisture gain also showed the greatest heat transfer, both in laboratory and road tests. However, not all of the difference in cooling load between the two specimens can be accounted for by the difference in moisture gain.

The trailers gained roughly from a half pound to one pound of moisture per hour during the laboratory test and showed a total gain of approximately 150 to 250 pounds during the road test. It was reasoned that air infiltration into the insulated cavity was the principal source of moisture gain since diffusion was found to be a nearly negligible factor. Diffusion was defined as the molecular movement of moisture from zones of higher concentration to zones of lower concentration under the influence of a difference in vapor pressure, while air infiltration was described as moisture-laden air passing through the trailer structure.

Air infiltration test results reported in a previous release indicated that the principal source of air leakage is the nose of the trailer, since the pressure differential between the nose and the interior at 50 mph was found to be approximately 1.25 inches water column.

In the course of the first road test the special White tractor and the Fruehauf trailer were operated approximately 2,500 miles while under test. The second road test was made with a Trailmobile trailer and the combination covered about 5,000 miles in test operation.

As a result of these tests it has been possible, for the first time, to obtain rather precise information about the effect of road speed on the temperature at various points surrounding the trailer. For example, on a clear day the roof temperature was observed to be 103 degrees, while the ambient was 75 when the trailer was standing still. At 50 mph the roof temperature dropped to about 80, or only five degrees above the surrounding air temperature.

Another interesting phenomenon was the observed temperature under the trailer. While operating over the road the temperature on the underside of the trailer floor was 15 to 18 degrees above ambient but, when standing with the tractor motor stopped, the temperature under the floor dropped to ambient. The above was observed to be true both at night and during the day and was even true at night during a rainstorm. Obviously, reflected heat from the road did not account for this temperature rise. This observed phenomenon may be of significance in relation to the need for floor insulation. Generally the temperatures under the floor were as high or higher than those observed on the roof when the trailer was moving at 50 mph, whether the sun was shining or not. The higher temperature under the trailer was thought to be caused by the discharge of the engine heat under the trailer.

NARW Safety Program Pays Off

RESULTS of his organization's 1956 industry-wide safety survey were announced recently by Sheffield A. Kadane, President of the National Association of Refrigerated Warehouses.

This survey, conducted annually among the more than 500 NARW member public cold storage plants, revealed a 20% decrease in accident frequency since 1952, the first year in which the survey was made.

Severity, also, has declined since that date with the current survey showing a decrease of more than 45%.

NARW Safety Committee Chairman A. R. Carstensen states that the survey has contributed immeasurably to the safety-consciousness of all member plants. NARW has been cited by the National Safety Council for the excellence of its safety program, of which the survey is one phase.

In the survey members are asked to submit information such as number of man-hours worked, number and type of accident, etc. From these figures national and regional accident frequency and severity rates are compiled.

Frequency is considered the number of lost-time accidents occurring for every one million hours worked and severity the number of days lost from all accidents occurring every one million hours worked.

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Cold Storage Firm Forms Food Radiation Company

ACCORDING to a report appearing in "Supermarket News," the Anaheim Cold Storage Co., Fullerton, Calif., has formed a new corporation, Radiation Corp. of California, and will build headquarters for this research firm in nearby La Habra, Calif.

Anaheim Cold Storage has been doing research in irradiation of food products and will utilize the facilities of the new corporation to expand its work.

The new plant will contain 1,500 square feet of offices, identical square footage of radiation rooms, and will house, in a separate building, machinery and conveyor belts for movement of products through the radiation room. The process will involve radiation from a resonant transformer and also from a Cobalt 60 source, it was said.

According to a spokesman for the firm radiated foods will definitely become a reality. The official said the process itself is commercially feasible, today, for many food items. In other products, some negative taste factors have occurred. The major stumbling block, according to the spokesman, seems to be Food and Drug Administration approval.

"FDA must be completely satisfied that radiated foods are not injurious to humans. The Agency is about half finished with a two-year program of experimentation on such animals as dogs, rats and monkeys. When that program is completed on about 23 radiated food items, another two-year program is planned using human volunteers. It now appears that the program could take three years for FDA approval, but if the program is accelerated, it could be done in about two years," the executive said.

Beatrice Foods Report

FOR the quarter ended August 31, Beatrice Foods Company reported net profit of $1,633,241, equal after preferred dividends to 75 cents a share on the common stock. This compares with $1,551,468, or 73 cents a share, in the same 1956 period. Sales for the quarter rose to $92 million from $89 million last year, setting a new high.

For the six months ended August 31 the company had net income of $2,896,960, or $1.32 a share, against $2,772,788, or $1.29 a share, in the same 1956 period. Half-year sales were $180 million against $172 million a year earlier.

Cold Storage Addition

A NEW concrete block addition to the cold storage plant of the Loughhead Cold Storage Company, Fresno, Calif., has been completed at 120 "O" Street, Fresno, Calif., at a cost of $175,000. The addition provides another 11,000 square feet of floor space, now filled to capacity with Emperor grapes, according to J. H. Loughhead, owner of the firm.

The original plant was built in 1945, and an addition, completed in 1947, doubled the capacity of the plant. With the latest addition, Loughhead now has facilities for the storage of approximately 200 carloads of grapes. Plans are already being weighed for expansions to provide freezing facilities and packing plant operations for fruits and vegetables, Mr. Loughhead said.

AWA Yearbook Published

THE latest Yearbook of the American Warehousemen's Association has just been distributed, the Association's president R. M. King announced. An industry history, dating beyond 1900, is to be found in the Yearbooks which have been published annually by the AWA for over fifty years. Each volume, containing complete proceedings of the latest national convention, is in bound form with a black cover and gold lettering. The Yearbook is distributed exclusively to AWA members. The current edition covers the 66th Annual Convention held this year in Atlantic City.

Ice Helped to do the Job

EVERY now and again we hear of some commercial or construction development requiring the use of ice, usually in pretty large quantities. We doubt, however, if anything quite so novel has occurred as the contract which threw a three or four hundred ton order right into the lap of Bill Morrow of Vancouver.

It seems that the Provincial Government in building a 2,100 ft. tunnel for traffic to run under the Fraser River to provide a direct route from Vancouver to the U.S. border, required that the temperature of the concrete sections that had to be floated out to the river, submerged and joined, had to be a certain temperature. To affect this, it was necessary to use ice in the mix in order to dissipate the heat and this gave Bill his opportunity. He thinks if he could just get a new tunnel every summer, his firm would be in clover.—CANADIAN ICE LETTER.

Plant Maintenance Show

THE PLANT Maintenance & Engineering Show, scheduled for the International Amphitheatre, Chicago, January 27-30, will include exhibits with almost 10,000 different products. The concurrent conference on maintenance and engineering, which will be held at the Amphitheatre and the Palmer House, January 27-29, will attract more than 2,500 engineers. Sixty-six speakers drawn from 22 states, the District of Columbia and Canada will address the 25 sessions. The show will include 120,000 square feet of exhibit space. This is 20 percent larger than the previous record, set at the 1957 show in Cleveland, and 50 percent larger than the last show held in Chicago in 1955. More than 400 of the nation's major companies will exhibit their products.

Blast Rips Wall In Ice Cream Plant

AN INSIDE wall of the Arden Farms Co. Ice cream plant, Los Angeles, Calif., was ruptured by the explosion of an ammonia compressor that was heard for two blocks around the building at 21st and Main Sts.

Fumes from broken refrigeration lines leading from the compressor drifted as far as 15th St. and Broadway and 14th and Hill Sts., causing a flood of complaints to police headquarters.

An operating engineer, Ruvin Barth, in another part of the plant when the blast occurred, said he immediately shut down the compressor and a nearby boiler. Firemen credited Barth's prompt action with preventing a fire.

Chicago Environmental Engineers

ON August 7, 1957, the proposed Greater Chicago Area Chapter of the Institute of Environmental Engineers met at the LaSalle Hotel. At this time, the group discussed and approved the by-laws for the Chicago Chapter and elected the following men as their officers: President, John R. Boyle, Boyle Engineering Laboratories; Vice-president, Edward A. Feldman, J. P. Seeburg, Incorporated; National Director, Steven Danko, Motorola, Incorporated; Secretary, Don A. Brosseau, Roth Manufacturing Corporation; Treasurer, Robert H. Jacobson, The Armour Research Foundation.

Following the meeting, the new Executive Committee met to discuss the business of the new Chicago Chapter. As a result of this meeting, a request was made to Mr. H. F. Sander, President of I.E.E., to hold the 1959 meeting of the I.E.E. in Chicago. It is the intention of this group that a program be laid out for the 1957-1958 meeting season.

New Law Provides For Inspection of Poultry

THE President and Congress are to be congratulated on the mandatory inspection bill which has been made law," Dr. Cliff D. Carpenter, president of the Institute of American Poultry Industries, said. "The poultry industry," he added, "has been successful in getting a bill that is workable for industry and a protection for the consumer. It contains the major provisions sought by industry. With this legislation, too, the poultry industry will be in a position to compete on an equitable basis with other meats, since the cost of inspection will be paid from federally appropriated funds."

The Poultry Products Inspection Act provides for the compulsory inspection of poultry for wholesomeness by the U. S. Department of Agriculture, effective January 1, 1959, to be paid for from federal funds. Processors, however, may apply for and receive inspection at government expense after January 1, 1958.

The law does not apply to poultry shipped intrastate (except in certain areas as may be designated by the Secretary of Agriculture), to live poultry, to eggs and egg products, to game birds or squabs. Specific exemptions are provided for producers who process their own poultry and sell direct to consumers or institutions, and for poultry processed in accordance with religious dietary laws.

Ante-mortem inspection will be performed to the extent deemed necessary by the Secretary of Agriculture. Post-mortem inspection will be performed on each carcass processed and in this connection the House of Representatives' report said, "the Secretary shall at all times provide sufficient inspectors and employ such procedures as will not slow down processing operations."

American Poultry Announces Awards

THE Institute of American Poultry Industries has established two awards which will be given to stimulate and reward research in the field of poultry and egg processing and marketing, according to an announcement made by Dr. Cliff D. Carpenter, president.

Beginning in 1958, an award of $1,000 will be presented by the Institute of Food Technologists on a biannual basis. In 1959, and in each alternate year to follow, an award of $1,000 will be presented by Poultry Science Association.

"It is the desire of our board of directors," said Dr. Carpenter, "to recognize outstanding research done in poultry and egg processing and marketing, which will contribute to increased consumption of our products. We would honor, too, outstanding contributions in closely related fields.

"As illustrations of contributions, we think of the development of equipment that would conserve nutrients or prevent wastage. Another might be the development of processes or procedures which would inhibit or prevent bacterial spoilage, oxidation, desiccation, or enzymatic deterioration of products. Improvements in the efficiency of packaging or storage or distribution are other examples."

A call for nominations for the 1958 award to be presented by the Institute of Food Technologists has been made. The nominee must be a person under 39 years of age on December 31, 1958. Nominations may be made by any member of IFT or any regional section of IFT, or by any member of the Institute of American Poultry Industries. A letter giving a biographical sketch and indicating the contributions that qualify the nominee for the award should be sent to IFT's chairman of the awards jury, Dr. C. H. Koonz, Swift & Company, Union Stock Yards, Chicago 9, Illinois. The nomination letters shall be limited to two, single-spaced typewritten sheets and are due before January 30, 1958.

The presentation of the Institute of Food Technologists' award will be made during the annual meeting of IFT scheduled May 25-29, 1958.

Graduate Fellowship Award

APPLICATION may now be made by qualified people for the S. C. Prescott graduate fellowship award, announced recently by The Refrigeration Research Foundation. Application should be made to the office of the Director, 12 N. Meade Ave., Colorado Springs, Colo. A descriptive and informative brochure is available to guide the prospective applicant.

Fox DeLuxe Food Sold

CHICAGO's Fox DeLuxe has been purchased by New York industrialist Frederick W. Richmond, according to an announcement made early in December. The purchase price was not made public. No change is contemplated in the name or management of the firm which specializes in frozen poultry, butter and other packaged frozen food products.

Bakery Refrigerating Plant

PLANS for construction of a new plant in Midland, Ontario, have been announced by William H. Pinchin, executive vice-president of Pillsbury Canada, Limited, London, Ontario, Canada. The modern 35,000 square foot structure will house lines for the production of cake mixes and refrigerated fresh dough products.

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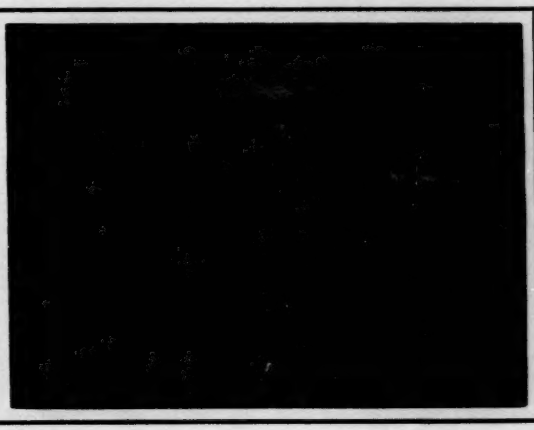

Patching Concrete Floors in Refrigerated Warehouses

NILS R. BERNZ, New York City, New York
(In cooperation with Stanley A. Hoffberger, Landover, Maryland)

A DEFECTIVE floor is a costly item in the refrigerated warehouse budget. It is costly not only with respect to repairs, but frequently interferes with warehouse activities and thus lowers the over-all efficiency of the warehouse operation.

In concrete floor repairs in general, there are a great number of materials, methods, and combinations employed with various degrees of success. For example, one cold storage concern with whom I have had correspondence, has reported success with a product known as Embeco, produced by the Master Builders Co., Cleveland, Ohio. The manufacturer claims a flowable non-shrink grout of high compressive and impact-resistant strength when this product is mixed with normal Portland cement, sand, aggregate and water.

The correspondent of the cold storage concern referred to above, states that on account of the cost of Embeco, they do not always use the Embeco mortar or concrete mix, but appear to make more use of the Embeco slush–bond coat, which when properly applied reportedly gives excellent results in patch work as well as in topping jobs. He further states, "It is the bond coat and preparation of the area to be repaired which we feel can mean the difference between a lasting job and one which is a source of repeated annoyance and expense." The final finish of the concrete floor or surface repair work is another very important item. In heavily traveled areas, for example vestibules, platforms, etc., a strong hard wearing surface is imperative. Special hardening agents such as Master Plate, and Hydroment are frequently used for this purpose.

Granolithic toppings of various specifications are often used to meet individual requirements. For good results, it is important to control the water-cement ratio; also that the topping be permanently bonded to the under slab to prevent cracking. A well troweled floor finish, with or without special hardening agents also helps to retard floor wear. Extensive machine and hand-troweling of the topping produces a dense hard floor finish of good wearing quality.

In line with special floor surfaces, however, nothing can compare in durability to cast iron grids embedded in the concrete. This latter method may be considered the ultimate in floor patching and floor repairs in general where heavy traffic is encountered. Although the method is costly, it probably eliminates floor troubles for the life of the warehouse.

From bulletin published by National Association of Refrigerated Warehouses.

Floor Repairs In Refrigerated Space (Freezers)

It has been found that concrete patch repairs can best be accomplished by embedding a cast iron grid plate in the damaged area. Incidentally, experience has shown that in most instances the patches which need attention usually occur near an expansion joint or score mark and results in dished out cavities which should be attended to as quickly as possible or at least before they exceed over-all dimensions of 8 inches to 10 inches. For repair of these cavities in a freezer room without taking the room out of service, the following procedure is followed:

1-Place a cast iron grid plate over the hole to be patched.

2-Draw a fine sharp chalk line around the grid.

3-Remove the grid. Use a power hand saw with a carborundum, or concrete cutting circular disc and cut along the chalk mark to the desired depth, preferably in stages of 1/4 inch each. If a saw is not available, an electric gun can be used and the edges squared off with a hammer and chisel. It is of utmost importance, however, that the edges are straight and sharp in order to secure as tight a fit as possible when placing the cast iron grid. A snug fit is of primary importance.

4-Clean out the hole thoroughly and remove all dust either with compressed air or bellows.

5-Prepare the necessary ingredients as follows to be done in a non-refrigerated area: (a) Make a dry mix of cement and sand in the proportion 1:2½, which should be mixed thoroughly. (b) Mix 5 lbs. of calcium chloride in 5 gallons of very hot water. (c) In a small can mix cement with the calcium chloride solution referred to above, and work it into a creamy paste.

6-Bring above materials to the location in the refrigerated room where the floor patch work is to be done and proceed as follows: (a) Brush the creamy cement paste referred to in Paragraph 5 c into the hole to be repaired, making certain that the bottom and sides will be well covered with the paint-like cement paste. (b) Mix the sand–cement and the hot calcium chloride solution into a very dry "concrete" mixture (the deeper the hole, the drier the mix) which is filled into the hole to be patched. It is important that the "concrete" fill is pressed well into all cavities and crevices by means of a trowel or other suitable tool. The hole should be filled up to the level of the floor, after which it is leveled by means of a straight edge (use a 2 x 4 in. piece of wood).

7-Sink the cast iron grid into the cement filled hole and press it down until level with the floor. Since the hole is cut to make it a close fit around the cast iron grid, it may be necessary to use a wooden mallet or a piece of wood (2" x 4") to tap the cast iron grid into position.

8-Remove excessive cement mixture with a wooden float and finish it off with a steel trowel.

9-Cover the patch with waterproof paper, tar paper, or cardboard and on top of this, place one layer of hair felt.

10-Leave the patch to cure for at least twenty-four hours, or better still over the week end.

In some cases where deep holes are involved, the hole is filled up to within 1½ inches from the top with cement, sand, and coarse aggregate, after which a 1½ inch topping of cement and sand, and possibly a fine aggregate (1:2:3) is provided. High early cement with calcium chloride solution has also been used successfully to speed up the curing of the cement work. Anti Hydro is used occasionally in place of calcium chloride with good results. The calcium chloride method, however, is less expensive and has proven just as effective.

Where large defective areas are encountered, it is sometimes desirable to provide a semi prefabricated insulated enclosure around the area to be repaired and to provide electric heat. Successful repair jobs have been accomplished by heating the enclosure to an air temperature of 70 F with the floor slab well over 40 F, before doing the cement work. Upon completion of the repair work, a two week curing period with a temperature drop of a few degrees each day, has proved desirable for the best results.

Frozen Food Fact Book

THE FACT Book and Directory of the frozen food industry, published by the National Frozen Food Distributors Association, is now being distributed to the trade. It contains a vast amount of statistical matter, a history of the industry and other data, and a full list of association members as well as packer members.

COMING CONVENTIONS

MISSOURI VALLEY ICE MANUFACTURERS ASSOCIATION
January 19, 20, 21, 1958
Hotel President
Kansas City, Missouri

OKLAHOMA ASSOCIATION OF ICE INDUSTRIES
January 19, 20, 21, 1958
Hotel President
Kansas City, Missouri

KANSAS ASSOCIATION OF ICE INDUSTRIES
January 19, 20, 21, 1958
Hotel President
Kansas City, Missouri

1958 FACT FINDING CONFERENCE
February 14-15-16, 1958
Municipal Auditorium
Kansas City, Missouri

INDIANA ASSOCIATION OF ICE INDUSTRIES
March 2, 3, 4, 1958
Marott Hotel
Indianapolis, Indiana

OHIO ASSOCIATION OF ICE INDUSTRIES
March 2, 3, 4, 1958
Marott Hotel
Indianapolis, Indiana

MICHIGAN ICE INDUSTRIES ASSOCIATION
March 2, 3, 4, 1958
Marott Hotel
Indianapolis, Indiana

THE REFRIGERATION RESEARCH FOUNDATION
March 6-8, 1958
Adolphus Hotel, Dallas, Texas
H. C. Diehl, Director

NORTH CAROLINA ICE ASSOCIATION, INC.
March 9, 10, 11, 1958
Sir Walter Hotel, Raleigh, N. C.
Lewis H. Powell, Secy-Treas.

AMERICAN WAREHOUSEMEN'S ASSOCIATION
March 10-13, 1958
Adolphus Hotel, Dallas, Texas
Wm. Dalton, Secretary

NATIONAL ASSOCIATION REFRIGERATED WAREHOUSES
March 10-13, 1958
Adolphus Hotel, Dallas, Texas
Wm. Dalton, Executive Vice-Pres.

AMERICAN POWER CONFERENCE
March 26-28, 1958
Hotel Sherman, Chicago, Ill.
R. A. Budenholzer, Conference Director
3300 Federal St., Chicago 16, Ill.

CANADIAN WAREHOUSEMEN'S ASSOCIATION
May 12-15, 1958
Seigniory Club, Montebello, Quebec
H. Cecil Rhodes, Managing Director

MASS PRODUCTION COSTS TOO HIGH?

Here's the ideal low-cost indicator for those hard-to-get-at places.

NEW "237" LIQUID EYE
Positive Sealing Indicator

(Illustrated 3/8" M. FL. x 3/8" FE. FL.)

The new Allin "237" has all the proved Liquid Eye features plus:

- smaller — more compact — dependable. (about 1/3'd smaller in the 3/8" male to female size than any previous unit).
- complete self-contained economy unit.
- new simplified design.
- available with 2 or 3 viewing ports.

Custom units can be made to your exact specifications. Consult Allin engineers now.
Write today for full information and catalog covering complete Allin line.

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NATIONAL QUALITY

REFRIGERATION COILS

— known for over 75 years for their smooth bends, expert welds and accurate measurements. Progressive engineering and skilful production guarantee effective performance from *all* types of NATIONAL COILS, HEATERS, CONVERTERS & HEAT-EXCHANGERS. *Send for free tracing-chart.*

NATIONAL PIPE BENDING COMPANY
Established 1883
162 RIVER ST., NEW HAVEN, CONN.

First Refrigeration Exhibit for Australia

IN CONJUNCTION with the Annual Conference of the Australian Institute of Refrigeration Incorporated, a comprehensive exhibition of Australian manufactured refrigerating equipment and materials for air conditioning, cold storage, food preservation, ice and ice makng plants, will be held in the Hordern pavilion, R.A.S. Showgrounds, Sydney, Australia, starting Tuesday, May 6th, through Saturday, May 10th.

The convention will consist of a series of lectures, and guest speakers will include Professor Doctor (Ing) Rudolf Plank of Karlsruhe, Germany, and George F. Taubeneck of Detroit, Michigan.

Bringing together for the first time in the South Pacific all refrigeration personnel, the exhibition and convention is designed to advance the knowledge and stimulate the interest of those concerned with buying and selling, and in the technical developments in Australia in food preservation, processing and comfort cooling.

1957 Pack Frozen Green Peas

THE 1957 pack of frozen green peas amounted to 293,143,162 pounds, according to a preliminary survey just completed by the National Association of Frozen Food Packers. While this is about 18 percent less than last year's all-time high of 359.7 million pounds, it becomes the second largest pack on record.

In spite of a 22 percent decrease from last year's Western pack, the still enormous production in that area was largely responsible for the size of this year's national pack. Midwestern production rose 40 percent over that of 1956 to partially offset the 22 percent decline in the East & South.

Carrier to Refrigerate PFE Reefers

PACIFIC Fruit Express Co. has ordered 675 mechanical cooling systems for rail transportation of frozen foods and perishable cargo. The contract amounts to nearly two million dollars. Five hundred of the systems are primarily intended for the refrigeration of frozen food shipments and the other 175 units are principally for the protection of fresh produce. However, all of the systems can be used for either purpose.

Air Conditioning— Its Growth and Impact

(Continued from Page 22)

use our products, point to an era of growth that will be almost without parallel in the story of American business. The potential is there; the industry is ready technique-wise, and the users are rapidly converting what we used to think of as 'public acceptance' into 'public demand.' Within the next decade the non-air-conditioned home will become as obsolete as is the home today without a central heating system; workers in virtually all fields will do their daily stints in air-conditioned surroundings, and will travel to and from work in air-conditioned vehicles. Mechanical refrigeration will become increasingly necessary for the processing and distribution of our food, as civilization becomes more complex and new types of foods are developed.

"Our industry has had an outstanding decade since World War II; the next ten years will see even greater growth and impact on our life and economy."

Stokely Van Camp Moves Headquarters to Oakland

THE headquarters of the frozen foods division of Stokeley Van Camp Co. at Mount Vernon, Wash., will move to Oakland, Calif., it was announced by H. S. Kirmendahl, company president. The division's headquarters was established in Mount Vernon in 1954 and Kirmendahl gave no reason for the move.

Kirmendahl said E. J. Watson, vice president and general manager of the frozen foods division, resigned to stay in the Pacific Northwest rather than move to Oakland. He will be replaced by William Foster, presently general manager of the Western foods division at Oakland. Kirmendahl said his company would continue to maintain a production and processing plant at Mount Vernon.

Frozen Foods in Sweden

SINCE their first appearance in the autumn of 1945, the sale of frozen foods in Sweden has advanced quickly. By 1947 Swedish consumption had reached about 200 tons. Now, ten years later, consumption is estimated at 12,000 tons and is expected to rise to 15,000 tons in 1958. This brings Sweden up to first place among European consumers and makes her the world's second largest consumer after the United States.

Proper Refrigeration Increases Meat Profits

(Continued from Page 31)

tends beyond the refrigerated space throughout the entire building as evidenced by deterioration of elevator equipment, electrical distribution systems, and other parts of the structure. Additional maintenance is required throughout the plant to avoid breakdown as well as unsightly conditions.

Dry Coils, Water Defrosted Best New Profit Source

The method of reducing refrigeration capacity after the peak load is passed, is of extreme importance and can have a pronounced effect on shrinkage. Water defrost coils with fins spaced four per inch have proven highly successful for hot carcass cooling, with defrosting performed as infrequently as twice per day. Defrosting requires only a few minutes and can be accomplished entirely by automatic control.

Location of both cold air discharge and return above the beams, as occurs with a ceiling type blower coil, provides a blanket of cold air above the carcasses. This practice insures rapid cooling of the heavy rump section, with minimum shrinkage.

Use in Carcass Coolers

There appears little justification for the use of brine spray systems in carcass coolers. The high operating cost and excessive maintenance cannot be justified in view of the superior results obtainable with other type systems.

Investigations reported herein developed convincing proof that these items of reduced post-peak capacity with water defrosting, proper air movement over heavier carcass sections first, and dry coil evaporative surface, have a pronounced effect on quality and on shrinkage. Careful attention to these items will increase product profits.

Refrigeration for Bagels

KNOW what a bagel is? It is a superb example of Jewish baking, a glossy doughnut of firm bread-like but slightly sweet dough, and you have missed something in life if you have not eaten one, according to H. C. Diehl, TRRF Director.

M. I. Isenberg of People's Baking Co., No. Minneapolis says "The freezer at my bakery is my bank. The old days of overtime baking are gone forever. If current supplies are adequate, bagels are frozen, at any stage of production, ready for later baking"—TRRF BULLETIN.

News of PEOPLE

Guy Jacobs Joins Steubenville Bank

THE BOARD of directors of the Union Savings Bank & Trust Co., Steubenville, Ohio, have announced the election of Guy W. Jacobs as chairman of the board, effective November 1. Mr. Jacobs comes to the chairmanship of Union Savings after serving as executive secretary of the National Association of Ice Industries. Mr. Jacobs was the association's president during 1938 and 1939 and post in 1951. He relinquished it to accept the board chairmanship of the Union Savings Bank. He is the only man ever to hold both the presidency and executive secretary's positions with the National Association of Ice Industries.

Mr. Jacobs was a Steubenville resident from 1917 until 1951. He has lived in Washington, D. C. for the past six years. He has returned to Steubenville and is residing at 712 Lawson Ave. in his former home. He came to Steubenville in 1917 and assumed charge of the Steubenville Ice Co. He directed the firm's expansion to include plants at Toronto and Weirton and served as the firm's secretary-treasurer and general manager until it was acquired in 1952 by the Federal Paper Board. Mr. Jacobs was instrumental in organizing Ice Products Inc. its successor and is secretary of that company.

Mr. Jacobs achieved national stature as an association executive in the ice industry. He helped organize the Ohio Association of Ice Industries and after serving on its board of directors and as president, he was chosen to be secretary of the association. He held this post from 1928 through 1951.

In 1936, he was selected as secretary-treasurer of the corporation the ice industry set up to establish advertising and public relations on a nationwide and industry wide level. He held this post until 1948 when he was made director of the department of public relations of the National Association of Ice Industries.

DAVID B. STEARNS of Milwaukee Cold Storage Co., was elected president of the Wisconsin Warehousemen's Association at the annual meeting at Creen Bay. He succeeds Harold M. Willenson of American Warehouse Co., Milwaukee, who was elected secretary.

Robert C. Hibben, IAICM Secretary, Retires

ROBERT C. HIBBEN retired as executive secretary of the International Association of Ice Cream Manufacturers and the Ice Cream Merchandising Institute on October 31, 1957.

Thirty-two years ago, when he joined the staff of the International Association, 240,018,000 gallons of ice cream were produced annually in the United States while the membership of the association totaled 380 members.

Today the country boasts an annual production of 848,484,000 gallons of ice cream and related products and IAICM membership rolls have swelled to 2,028 members from throughout the U. S., Canada and Foreign countries.

Born in Iowa, Hibben was raised on a farm near Fremont, Nebraska and received his early experience working in creameries in Iowa and Nebraska. Upon graduation from Iowa State College he taught as assistant professor of the Dairy Department at the University of Nebraska.

North Named Secretary

Robert H. North became executive secretary on November 1 succeeding Mr. Hibben.

North joined the staff of IAICM in 1945 as executive assistant and public relations director. He was named assistant executive secretary in 1954.

Drapeau Joins Staff Of National Bureau Standards

J. J. DRAPEAU, a mechanical engineer, has joined the Air Conditioning, Heating, and Refrigeration Section of the Building Technology Division of the National Bureau of Standards. Mr. Drapeau will study heat and moisture transfer in refrigerated structures, and participate in the development of a standard rating method for such structures.

Mr. Drapeau received a Bachelor of Marine Engineering degree from Maine Maritime Academy in 1945 and a Bachelor of Science degree in mechanical engineering from the University of Maine in 1951. Prior to coming to the Bureau, Mr. Drapeau worked as a senior test engineer for the Wright Aeronautical Division of Curtiss-Wright Corporation, and as a mechanical engineer for A. J. Harriman, Inc.

C. B. MORRISON, managing director of York Shipley Limited for the last 17 years, has been elected chairman of the company's board of directors, it was announced by Rowland Burnstan, president of Borg-Warner International Corp. Mr. Morrison has been succeeded by E. M. Heap and R. W. Hemmings who have been appointed joint managing directors.

York Shipley, a member of the B-W International group and a wholly-owned English subsidiary of the parent Borg-Warner Corp., is located in London.

MANUFACTURERS' NEWS

Armstrong Cork Appoints Superintendent of Contract Operations

JOHN E. ZELLER has been appointed to the newly created position of General Superintendent of Construction in Insulation Contract Operations of the Armstrong Cork Company.

A. E. Pearce, General Sales Manager of the Insulation Division, said the new position was established in order to further concentrate necessary effort on job organization techniques and strengthen supervision on large contract jobs.

Zeller will be replaced as an Assistant in Contract Operations by Robert H. Lawrence, who has served in the Baltimore District Office for the past 10 years. Pearce also announced that Claude E. Foster, of Armstrong's Dallas District Office, has been transferred to Houston as Branch Manager.

Kirkpatrick Named Manager For Transport Firm

HENRY O. KIRKPATRICK was named general manager of American Manufacturing Company, manufacturers of refrigeration and air conditioning equipment for the transport industry. Mr. Kirkpatrick founded Coldmobile Company in Detroit, Mich., in 1948 to manufacture and market truck refrigeration and mobile air conditioning units. He was president of the firm until 1951 when it became a division of Union Asbestos & Rubber Company of Chicago, Illinois. Since that time he served as division manager to June of 1956 when he was appointed vice-president, refrigeration, Hunter Manufacturing Company, Solon, Ohio. Holder of several patents on truck refrigeration and mobile air conditioning apparatus, Mr. Kirkpatrick has been active in transport refrigeration since 1938.

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Completely modern metalworking machines, plus over 37 years of "know-how", assure the finest work to your exact specifications. Proven specialists in custom bending in any form, any metal, even stainless steel.

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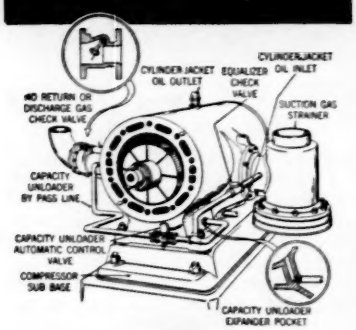
Most Popular Refrigeration Booster

FULLER ROTARY

featuring capacity unloading


CYLINDER JACKET OIL OUTLET
EQUALIZER CHECK VALVE
CYLINDER JACKET OIL INLET
NO RETURN OR DISCHARGE GAS CHECK VALVE
SUCTION GAS STRAINER
CAPACITY UNLOADER BY PASS LINE
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Qualified distributors in principal cities
LOW TEMPERATURE FREEZING EQUIPMENT

Armour Ammonia Opens Eastern Distribution

NEW eastern regional facilities at Lodi, N. J. have been opened by Armour and Company to assure faster and more efficient service for the company's chemical, adhesive, ammonia, coated abrasives and cushioning products customers.

The installation, specially built for Armour and occupied under a long term lease, consists of two warehouse and office buildings and a tank farm. The facility was officially opened with a ribbon-cutting ceremony by J. E. McLean, New Jersey State Commissioner for Conservation and Economic Development.

Each building is one story in height, of brick, concrete block and steel construction. Building No. 1 has 18,000 square feet of space under cover and is used by the Amonia and Chemical division. Along with office and warehouse space, it houses ammonia cylinder filling operations. The building has loading dock facilities for seven trucks.

To the rear is a tank farm consisting of two anhydrous ammonia storage tanks and four aluminum bulk fatty acid tanks. The two buildings and tanks account for about one acre of the 570 by 365 foot plot.

The Lodi installation is conected by direct teletype service with the Armour Auxiliaries headquarters in Chicago and with the Coated Abrasives and Cushioning Products divisions' headquarters at Alliance, Ohio.

Pittsburgh Corning Appointment

THE appointment of James R. Vivian as sales representative attached to the company's Philadelphia Office has been announced by Paul D. Japp, vice-president of the Pittsburgh Corning Corp., Pittsburgh, Pa. Mr. Vivian, a graduate of Pennsylvania State University, will assist distributors of Foamglas Low Temperature and Industrial Insulation, and will contact contractors and engineers concerning the application of this product. Mr. Vivian, who was born in Nanticoke, Pa. was formerly associated with Topflight Corporation. He will be located at the Pittsburgh Corning Corporation, Lewis Tower Building, 225 South 15th Street, Philadelphia, Pa.

VAN RENSSELAER H. GREENE

ENGINEERS

COMPLETE PLANT DESIGNS INCLUDING BUILDING AND EQUIPMENT

11 PARK PLACE NEW YORK 7, N. Y.

Trane Increases Floor Space

THE Trane Company, LaCrosse, Wis. manufacturers of air conditioning and heating equipment, increased company floor space by about 21 per cent during 1957. Floor square footage now comes to 1,474,757 as compared with 1,207,557 square feet at the end of 1956.

Plant space was increased 23 per cent in LaCrosse, where the firm has its main offices. The total was raised to 1,094,027 square feet as against 886,827 for 1956. Included are a new 65,000 square foot engineering technical center, a 60,000 square foot shipping center, the first phase of a laboratory expansion and a new 78,000 square foot production facility. Expansions at Scranton increased facilities 21 per cent and 17 per cent at Toronto.

Plans for 1958 include completion of the second phase of the laboratory expansion which, coupled with the 1957 project, will result in doubling the research center dedicated in 1954 and the construction of a $1.5 million plant in Clarksville, Tennessee, where central-type residential air conditioners will be produced. This 150,000 square foot plant is expected to be completed in spring, 1958.

New Sporlan Sales Engineer

Terry J. Allen

THE appointment of Terry J. Allen as sales engineer is announced by Sporlan Valve Co., St. Louis, Mo. He will work with Jack Dannels out of Sporlan's Cincinnati office. A graduate of Miami University (Oxford, Ohio). Mr. Allen holds a Bachelor of Science Degree in Industrial Management, and studied mechanical engineering at the University of Cincinnati. Prior to joining Sporlan, he worked for the Cincinnati Air Conditioning Company, Cincinnati, Ohio, as a design engineer.

Catalogs and Bulletins

New Fire Ban Bulletin

INSTRUCTION for applying Fire-Ban over insulation surfaces, as well as mixing and erection procedures, are published in a new 4-page bulletin by E. H. O'Neill Floors Co., Cicero, Ill. Originators and manufacturers of *Fire-Ban*, E. H. O'Neill Floors Co., has detailed some 26 important points to remember for mixing and troweling Fire-Ban finish. The 4-page folder contains instruction on how to wet mix, how to mix and apply scratch and finish coats, one coat method application, and applications at extreme temperatures. The booklet also contains instructions on Fire-Ban insulation erection cement for applying insulation to masonry ceilings and walls, and for cementing insulation to insulation.

New Recold Literature

LITERATURE on the new Recold Deltric (Catalog Number 14C7a) has been released by the Recold Corporation, 7250 East Slauson Avenue, Los Angeles 22, California. The Recold Deltric, the newest addition to the Recold line, is an electric defrost unit designed specifically for 28 meat storage rooms and other applications with light frosting problems. Featuring the exclusive Thermovane door, the Deltric is completely automatic when installed with a time clock.

The Catalog on the new Deltric, available by writing direct to Recold, shows pictures, typical installations, and other features.

Motor Control Bulletin

REPORTED in November 1957 *Industrial Refrigeration*, design features in Allis-Chalmers front access, high voltage starters (Type H) for 2300 to 5000-volt motors are given in a new bulletin released by the company. Pointed out: the starter's roll-out type air-break contactor which makes inspection and routine maintenance easy; availability with oil-immersed contactor which fits in the same space as the air-break contactor; eight way protection provisions for men, motors and machines; and the way in which components are separately tested. Copies of the bulletin, "Type H Motor Control," 14B8507, are available on request from Allis-Chalmers, Milwaukee 1, Wis.

Insulation Spec-Book

INSULATION specifications on plumbing and heating, air conditioning and cold storage are contained in a new three ring binder with plasticized cover, now being furnished by Johns-Manville to architects, engineers and contractors in these fields. The manual has been especially prepared to aid those parties responsible for writing thermo-insulation specifications for piping and equipment in office buildings, schools, hotels, institutions cold storage rooms, and similar commercial projects.

The manual consists of two parts, indexed in color. The first part contains insulation specifications that can be copied directly in the job specifications. The second part contains descriptive literature on the insulating products mentioned in the preceeding section. The booklet can be obtained from local Johns-Manville contract applicators or from Johns-Manville headquarters, New York 16, N. Y.

Vogt Weld Caps

A NEW revised bulletin on Vogt Weld Caps has recently been issued by the Henry Vogt Machine Co., Box 1918, Louisville, Ky. and replaces page 255 of the F9 catalog. The new bulletin covers new sizes and materials with complete dimensional information. Vogt Weld Caps are designed for use in pipelines, headers and pressure vessels.

for all low temperature and cold water line pipe covering. All sizes from ¼" thru 16" pipe & tubing. Perfect Vapor Barrier. Quick, easy to apply. 36" lengths—featherlight. No outer covering needed.

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Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

Position and Help Wanted

WANTED — MANUFACTURER'S REPRESENTATIVE with experience in refrigeration field. Territories available for revolutionary new discharge and suction valves for heavy duty industrial compressors. A tested and proven product that can be handled alone or with other lines. Write Box 333, % Industrial Refrigeration.

USED EQUIPMENT—wanted & for sale

FOR SALE—Three Carrier 30B4 Freon-12 chiller units; approximately 18 months in service. Two units equipped with 100 h.p. 440/3/60 motors, direct connected, nominally rated at 100 ton air conditioning. One unit equipped with 75 h.p., 440/3/60 motor, direct connected, possible capacity of 40 ton refrigeration at 0° F and 9.2# suction. All three units complete with gauge board and controls, including starters. Presently dismantled and ready for loading. Complete lot of equipment f.o.b. storage site at Green Bay, Wisc. $16,-200.00. Write or phone Gartner Refrigeration & Mfg. Inc., 2913 Lyndale Ave., South, Minneapolis 8, Minn. Phone TA 7-3533.

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois. WAbash 2-3299

FOR SALE—3 General Electric compressors. 3 Niagara coolers. Matched sets for low temperatures. Perfect operating condition. Write Dearborn Beer Distributors, 6031 Joy Road, Detroit 4, Mich.

FOR SALE—AMMONIA

4—10"x10" 4-cyl. York duplex D. C. to 225 h.p. motor.
2—10"x10" 2-cyl. York D.C. to 100 h.p. motor.
1—9"x9" 2-cyl. York D. C. to 75 h.p. motor.
4—9"x9" 2 cyl. Frick compressors.
1—7⅝"x5" Frick booster.
2—7½"x7½" 2-cyl. York compressors.
1—5¼"x4¼" 6cyl. V/W York booster compressor.
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11"x22"x47"—11"x22"x51 ice cans.
From 20 to 100 ton ice plants. York & Frick.
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79 Alexander St. Box 502 Yonkers, N. Y.
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USED EQUIPMENT—continued

FOR SALE—45 ton York "Freon" compressors (2) Model E-O, 6 cylinder; like new. $750.00 each. Also copper tube condensers and coolers for same. Atlas Salvage Corp., Blandensburg, Md.

FOR SALE—8x8 York, overhauled, $350.00. 1—20"x10 ft. receiver. Valves up to 2", ½ price. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE

10x10 York Model D8 125 h.p.
9x9 York Duplex Model D8, 360 r.p.m. 200 h.p.
10x7½ & 8x6 York Model D8 boosters.
7½x7½ York w/V-belt drive 50 h.p. motor.
300 h.p. Westinghouse starter, 4160 V. (new).
100 h.p. 1200 r.p.m. GE motor w/starter.
(3) 28"x17' York shell & tube condensers.
10x10 Ingersol Rand air compressor.
(3) open end shell & tube brine coolers with 135 2" tubes 12' long.
6x6 York w/condenser with two water coolers 500 GPM.

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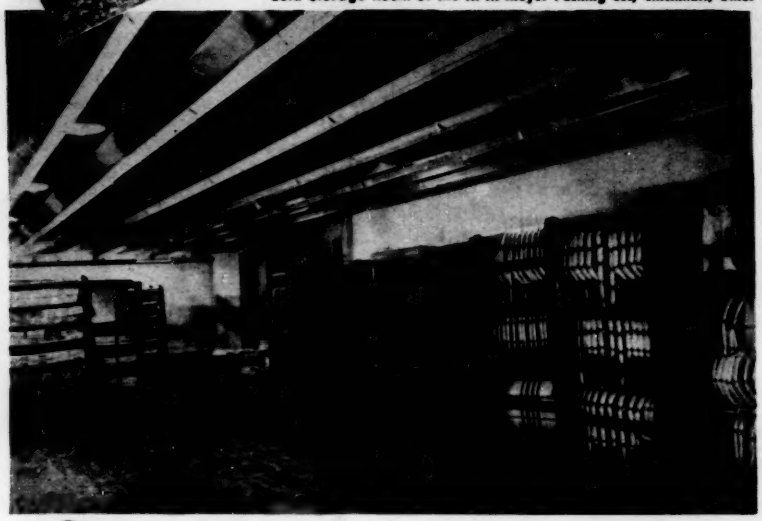
Complete 12 can pull, 70 ton ice plant, maintained in top condition. Can be seen in Operation. Owner wishes to retire. Asks $12,000. f.o.b. middlewest; this includes dismantling and loading. Plant is near water. Can be loaded on barge for cheap freight. Born Company, 80 E. Jackson Blvd., Chicago 4, Ill. WAbash 2-3299.

With the complete absence of fans, blowers, or ducts, you will find that Zer-O-Disc fin coils give you less trouble than any other type of coil surface. Due to their unique design you save significantly in price, space, weight, labor and refrigerant.

Cold Storage Room of the H. H. Meyer Packing Co., Cincinnati, Ohio.



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No shrinking links in this cold storage room!

Full, firm links... no shrivel... no shrinkage—that's the success story of sausage storage in the holding room of the *H. H. Meyer Packing Co., Cincinnati, Ohio.* Vilter Zer-O-Disc fin coils provide the desired cooling.

Vilter Zer-O-Disc fin coils are a smart buy for storage cooling. Correct temperature and humidity are maintained because these coils produce slow, even, positive air circulation naturally by convection. The extended fin surface cools the slowly moving air mass more quickly... floods the room with cold... holds temperature at proper level for better storage. There are no "dead spots" in the room. Product discoloration or shrinkage are minimized.

Call in your nearest Vilter representative and let him show you how you can improve your storage cooling for meats and sausages and save with Vilter Zer-O-Disc fin coils.

Sold and installed by Vilter Distributor, C. P. Wood & Co., Cincinnati, O.

Write for helpful bulletin to The Vilter Manufacturing Company, Dept. H-703, 2217 S. First Street, Milwaukee 7, Wis.

Bulletin 518
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ADVERTISERS

American Hair & Felt Co. 9
Alco Valve Co. 8
Allin Mfg. Co. 51
Armstrong Cork Co. .....Inside Back Cover
Armstrong Machine Works 45

Ball Valve Co. 10
Brown Mfg. Co., Inc., K. G. 49
Butcher Boy Refrigeration Door Co. 28 and 29

Carrier Corp. 12
Chicago Nipple Mfg. Co. 54
Classified Advertising 55
Creamery Package Mfg. Co., The 1

Detroit Ice Machine Co. 47
Dole Refrigerating Co. 43

Freezing Equipment Sales, Inc. 54

General Chemicals Div., Allied Chemical & Dye Corp. 5
Glo-Brite Products Inc. 55
Greene, Van R. H. 54

Howe Ice Machine Co. 6

Jamison Cold Storage Door Co. ..Back Cover

Kramer Trenton Co. 2

National Pipe Bending Co. 51
Nickerson & Collins Co. 49

Perfection Ice Scoring Machine Co., The .. 45

Refrigeration Engineering Co. 43

Swift & Co. 41

Taylor Instrument Companies 7
Texas Co. .....Inside Front Cover

United Cork Companies 37

Vilter Mfg. Co. 56

Wanted and For Sale Advertising 55
Watkins Co., J. E. 39

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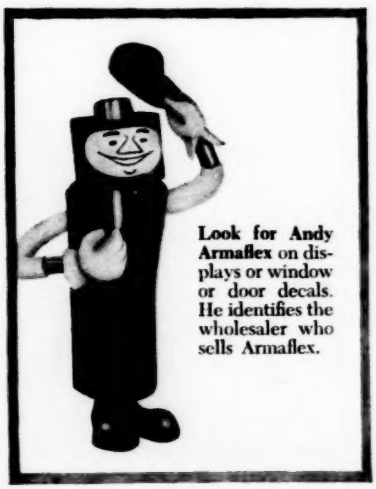


Look for Andy Armaflex on displays or window or door decals. He identifies the wholesaler who sells Armaflex.

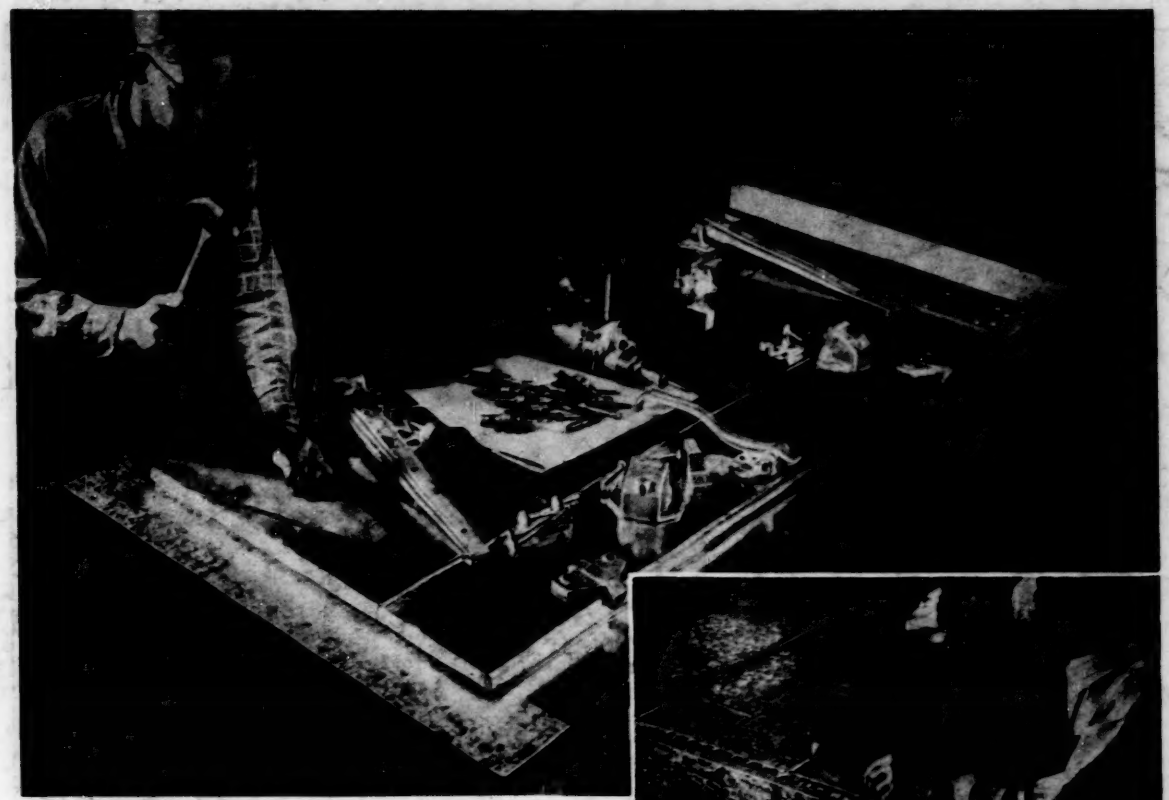
Now Armstrong Armaflex® comes in three wall thicknesses—⅜", ½", and ¾". With this greater thickness range, you can specify the economical amount* of insulation to stop condensation, or to save heat, on any line operating from 200° F. all the way down to zero. Armaflex is a highly efficient, flexible, foamed plastic material with a k factor of .28 at 75° F. mean temperature. Its closed cell structure is impervious to air or vapor penetration.

A big advantage of this flexible insulation is the speed with which it can be applied. Labor costs drop as much as 50%, compared to costs of applying more conventional insulations to pipes and fittings. Armaflex can be slipped over piping before connections are made, or slit and snapped on. Joints are sealed with 520 Adhesive. Fittings are insulated with miter-cut pieces.

* Recommended Armaflex thicknesses for various service conditions are contained in free descriptive booklet. For your copy, write today to Armstrong Cork Company, 2201 Skye Drive, Lancaster, Pennsylvania.

Armstrong INSULATIONS

NEW Jamison VAP·R·TYT* feature gives metal clad doors full protection against moisture penetration

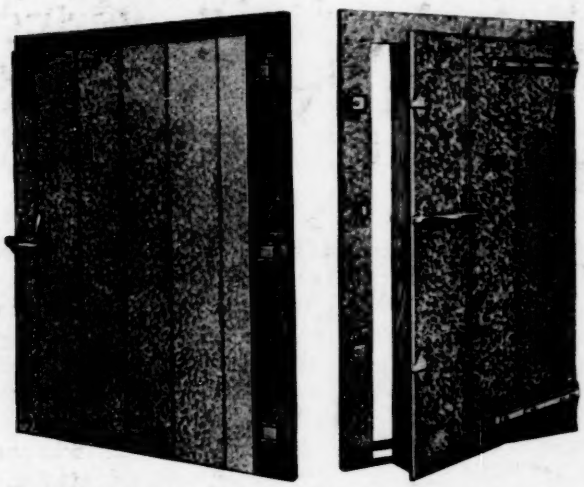


Sealed Penetrating Bolts. The bolts that attach hardware are completely sealed on the warm side.

Locked and Soldered Seams (right) also add to all-around protection.

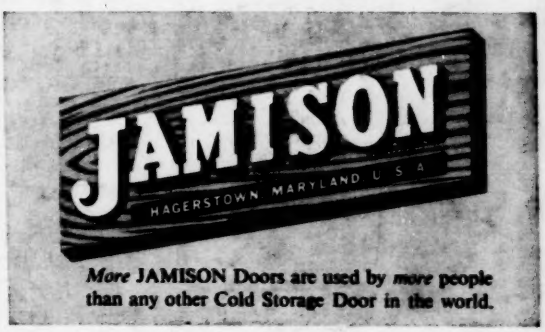
Vap-r-tyt construction of locked and soldered seams and sealed penetrating bolts is an exclusive Jamison feature. Vap-r-tyt adds longer life to cold storage doors by guarding against deterioration which invariably results when moisture condenses on the inside of the door.

For practical solutions to your door problems in low temperature storage, first get the facts from Jamison. Write to Jamison Cold Storage Door Co., Hagerstown, Md.



All Jamison Super Freezer Doors (left) and Lo-Temp Doors (right) are furnished with Vap-r-tyt construction as standard equipment. Vap-r-tyt is also available as an extra on other metal clad doors.

**Vap-r-tyt is a Jamison trademark*



More JAMISON Doors are used by *more* people than any other Cold Storage Door in the world.